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THE IRON TRADE REVIEW

A Weekly Journal Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

VOLUME XXXVII CLEVELAND, OHIO, SEPTEMBER 29, 1904 NUMBER 39

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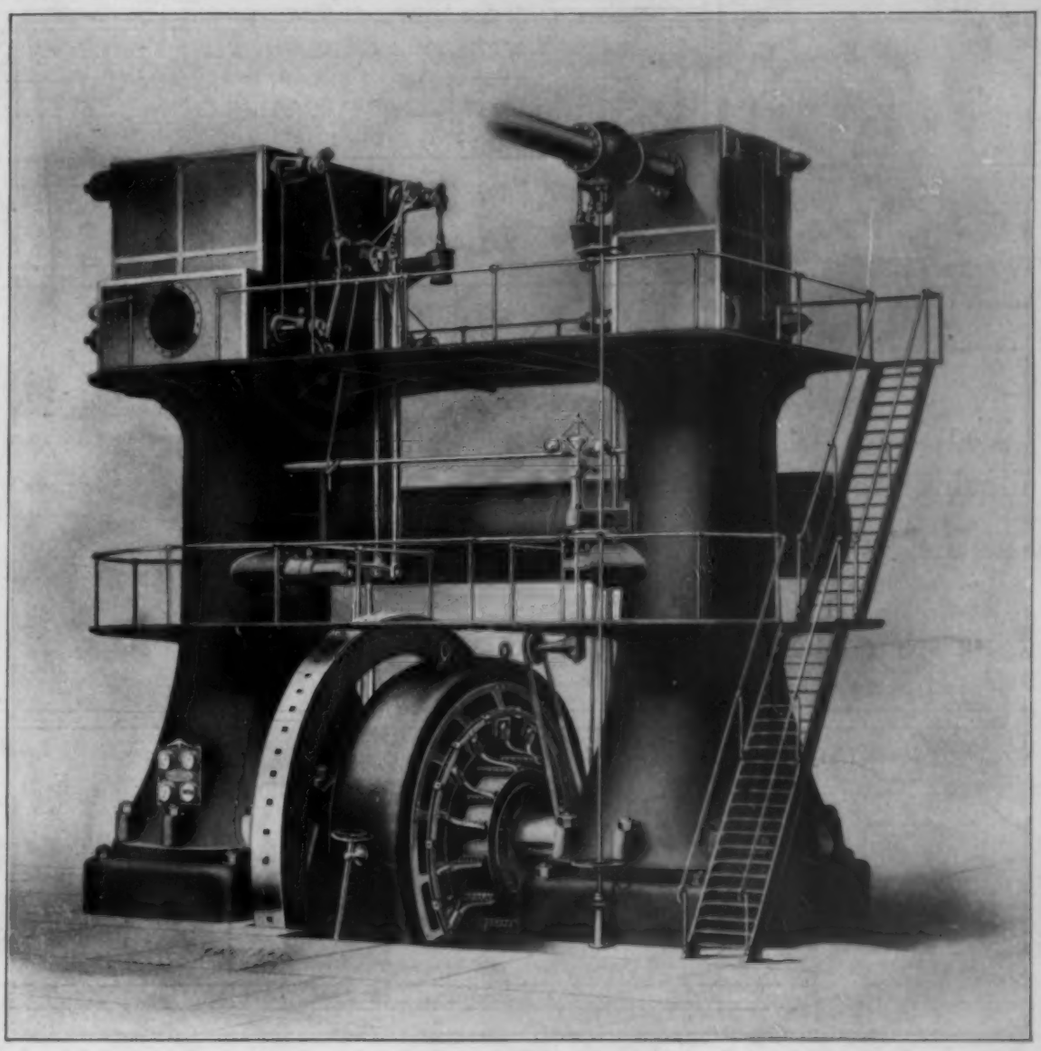

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THE IRON TRADE REVIEW

VOLUME XXXVII CLEVELAND, OHIO, SEPTEMBER 29, 1904 NUMBER 39

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Improvement both in sentiment and in demand has been noticeable in the iron trade in the past week. This has been more pronounced in foundry pig iron, the market for which, being the most open of all, may be taken to reflect most correctly the underlying conditions. The foundry trade, which represents widely ramifying demands of varied classes of consumers, shows signs of recovery from the prostration of more than a year. And if, as now seems likely, it is to make new additions to the demand upon blast furnaces, that has been really surprising for the way it has sustained itself in the nine months of this year, there is good reason to count on an output of close to 16,000,000 tons of pig iron in 1904. For a bad year that would be a record significant of sounder business foundations than the surface developments have suggested.

Beginning with last week the buying for foundries has grown to considerable proportions, the East, the Middle West and the Chicago districts reporting contracts that no doubt aggregate the best week's total for this year. It is significant that this buying has been to a less extent at the expense of prices than was the case with similar movements earlier in the year. In some directions a firmer market has resulted, particularly in the West, though in other instances the eagerness of individual furnaces has resulted in the duplication of the prices some of the Northern furnaces have been naming in the past three months. In the East, a large steel company caused some commotion by putting on the market a surplus of pig iron at figures merchant furnaces could not meet. In the Pittsburg district sales of 20,000 tons of pig iron are reported, largely foundry iron, $12.60 for No. 2 being the average price, or rather more than the purchasers had expected to pay. Bessemer pig iron for delivery in the last quarter has sold at $12 at furnace, though $11.85 can be done for early delivery. There is some buying of foundry iron for next year, but buyer and seller prefer for the most part to keep on this side of the line. The fact that in all Northern districts both sales and shipments of pig iron are in excess of current production has made sellers more confident of the future, and while there are still those in the trade who are not convinced that the present stronger condition will persist, the improvement is too palpable for division of opinion on the immediate facts.

It cannot be said that finished material markets have made any gain in the week. If there were serious expectations that the price reductions would add greatly to the volume of business they have been disappointed. Specifications have been of good volume. There is a noticeable gain in this respect and it furnishes reason for the increase of active blast furnaces of the Steel Corporation to 79 percent of capacity, with increased activity at steel works. The larger independent steel companies, some of which have not had the extreme fluctuations in active capacity of steel works experienced by the Steel Corporation, are also expanding their production because of better specifying. Structural mills are more active than at any time this year. New business is naturally not heavy, though in the East important bookings reported in the past week by fabricating concerns aggregate 12,000 tons. Some considerable business is pending in wrought pipe for gas lines. Sheets are rather more active at the low prices recently made. Wire mills are fairly busy and in Central territory prices are substantially maintained, while the West is set apart by the leading interest for such competition as the independent mills have invited and promise to continue to invite. Tin plates have been cut 10 to 15 cents a box below the $3.30 price last established, and large sales have been made at concessions.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, 429 PARK BUILDING, Sept. 28.

Not for many months has the pig iron market been as active as during the past week or ten days. Sales aggregating 20,000 tons have been made, and several inquiries are still pending. Foundries, covering their requirements for the last quarter, have been the heaviest buyers, although iron mills have taken a round tonnage of forge iron. One leading foundry interest purchased 7,500 tons of foundry and forge iron, of which 3,000 tons went to Southern furnaces and the remainder was distributed among stacks in Western Pennsylvania and in the Mahoning Valley. The Southern foundry and forge was sold on the basis of $9.50 for No. 2, a higher price than the consumer expected to pay. The Northern foundry iron was placed on the basis of $12.60, Pittsburg for No. 2. We also note the sale of 2,000 tons of foundry iron at $12.70, Pittsburg, one lot of 1,000 tons on which the furnace realized a somewhat higher price on account of the location of the consumer, and another lot of 2,000 tons of foundry at $12.50 and $12.60, Pittsburg. We also note the sale of several 1,000-ton lots of forge iron at $11.85 and $12, Pittsburg delivery. There were other numerous smaller sales of foundry iron, indicating a pretty general resumption of the foundries in this district, that have been doing very little the greater portion of the year. One sale of 5,000 tons of Bessemer is reported for delivery the last quarter at $12, furnace, although lots for immediate shipment can be had at concessions of from 10 to 15 cents a ton. The heavy buying of iron in this market has checked the downward trend of prices, but it is doubtful if this sudden spurt will be followed by normal buying, inasmuch as practically all the interests with future orders on their books have covered for their entire requirements.

In finished lines the market continues quiet, little new business being placed, although specifications on running contracts are heavier than at any time this year. This to a large extent accounts for the resumption of a number of idle steel works and furnaces and producers have been encouraged and believe that the outlook for the future will be much brighter and that consumption will continue to increase. The reduction on sheet bars has not brought about lower prices on sheets, producers holding out for 2.10c for 28 gauge on the ordinary run of orders, while a desirable order can be placed on the basis of 2c. Shading on tin plate has been reported ranging from 10 to

15 cents a box, these prices being made by several independent interests. Sales of close to 50,000 boxes have been made at concessions from the regular price of $3.30 a box. With the mills fighting for tonnage, which is the usual condition at this season of the year, still lower prices are looked for. In line pipe several large orders for gas lines are pending and will be closed shortly. The merchant pipe trade however continues exceedingly quiet for this season of the year. Locally prices on nails and wire products are being pretty well maintained, although the price war in the west continues, and exceedingly low prices are being made to jobbers as an inducement to lay in heavy stocks. The reduction on billets has not stimulated buying, while the plate market has not responded to the recent cut. The McClintic-Marshall Construction Co. has received an order for about 2,000 tons of plate girder bridges from the B. & O. Railroad, and outside of the orders for ship plates, noted heretofore, there is little doing. Structural mills are operating better than at any time this year, hurrying orders to completion before the winter season sets in.

Pig Iron.—The heavy buying of iron on the part of the foundries, would indicate that more work has come into their shops, and a revival of the foundry trade, which has suffered probably more than any other branch of the iron industry is hoped for and anticipated. Many of the foundries in this district that have not bought iron in six months have covered to the end of the year during the past week, and in every instance the consumer has orders on his books for which the iron was purchased. The Bessemer iron market, however, continues quiet, apart from a sale of 5,000 tons for delivery the last three months. With its increased pig iron producing capacity, much of which has become available in the past six months, the United States Steel Corporation does not promise to become a buyer in the Bessemer market until demand is far above the present and even exceeding the demand during the boom years. Fully half of the independent Bessemer iron producing capacity in the Valleys continues idle and the outlook for an early resumption is far from bright. As a result of the recent buying, No. 2 foundry iron is pretty well established on the basis of $12.60 to $12.70, Pittsburg, and it is doubtful if forge iron can be had below $12. Southern producers are almost a unit in asking $9.50 Birmingham, and despite the great difference in price between the latter and Northern, a considerable tonnage of the Southern product was sold in this market recently. We revise quotations as follows:

Bessemer, Valley	$11 85 to 12 00
Bessemer, Pittsburg	12 70 to 12 85
No. 1 Foundry	12 00 to 12 25
No. 2 Foundry	12 60 to 12 70
Gray forge, Pittsburg	11 85 to 12 00
Chilled basic, Valley	11 65 to 11 75
Chilled basic, Pittsburg	12 50 to 12 60

Steel.—The reduction in the prices of billets, sheet and tin bars has not yet stimulated buying, although the manufacturers are attempting to impress on the trade that bottom has been reached and that lower prices if looked for will not be realized. The Republic Iron & Steel Co., although it has just awarded the contract for its sheet and tin bar mill, and does not expect to become a producer until next spring, has already taken contracts from several independent producers for their requirements. We make the following quotations: Bessemer and open-hearth billets, 4 x 4 inches and slabs, upto and including 0.25 carbon, $19.50, f. o. b. mill, Pittsburg, Wheeling or Youngstown, with actual freight added to point of delivery from Pittsburg; 0.26 and including 0.60 carbon $1 advance; 0.61 to 1.00 carbon $2 advance. Billets smaller than 4 x 4 inches, $2 advance; sheet and tin bars $2 advance. Bessemer and open-hearth rods are held at $25 to $25.50.

Ferro-Manganese.—The market continues quiet, and buying is limited to small lots almost entirely. We quote domestic ferro at $41 a ton, delivered at buyer's mill, at any point east of the Mississippi.

Spelter.—There is somewhat better demand for spelter, and prime western grades are held at 5.13c, Pittsburg, in carload lots.

Muck Bar.—There is little demand for muck iron which is held nominally at $23.50 to $24, Pittsburg.

Skelp.—Practically all consumers have covered their requirements until the end of the year, and while most of the mills are operating in full, few new orders are being placed. We quote steel skelp at 1.25c for grooved, and 1.30c to 1.35c for sheared. Grooved iron is held at 1.40c and sheared at 1.45c to 1.47½c.

Rails and Track Material.—Despite reports to the contrary, the railroads are not interested in buying rails for next year's consumption, and no meeting of the rail producers will be held in the immediate future to fix a price for 1905. Action will not be taken until it is certain that several large buyers are anxious to cover, and the indications are that nothing will be done until close to the end of the year. We quote: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 16 to 40 pounds, $20 to $21. Spikes, 1.55c to 1.60c.

Plates.—The McClintic-Marshall Construction Co. this week received an order for 2,000 tons of plate girder bridges, but outside of this no large contracts have been placed. We make the following quotations: Tank plate, ¼ inch thick, 6¼ to 24 inches, inclusive, 1.30 f. o. b. mill, Pittsburg; over 24 inches up to 100 inches, 1.40c. Extras are as follows per pound: Flange and boiler steel, 10c; marine, A. B. M. A., and ordinary fire box, 20c; still bottom, 30c; locomotive fire box, 50c; plates over 100 inches up to 110 inches in width, not less than 5c per 100 lb. extra; plates 110 inches to 115 inches wide not less than 10c extra; 115 to 120 inches, 15c extra; plates 120 inches to 125 inches wide, not less than 25c extra; plates 125 inches to 130 inches; not less than 50c extra; plates 130 inches wide, not less than $1 extra; plates 3-16 inch thick, $2 extra; gauges 7 and 8, $3 extra; No. 9, $5 extra. Five cents extra for less than carloads. Terms net cash in 30 days, and for all points of delivery in the United States except the Pacific Coast.

Structural Material.—The structural mills in this district are now operating at a greater capacity than at any previous time this year, contractors pushing the mills for shipment of material before winter sets in. The large orders placed recently have nearly all been placed in the hands of the mills, the structural shops being anxious to turn out as much of this work the remainder of the year as possible. We make the following quotations: Beams and channels, up to 15 inches, 1.40c; over 15 inches, 1.50c; angles, 3 x 2 up to 6 x 6, 1.40c; zees, 1.40c; tees, 1.45c; angles, from 3 to 16 inches, 1.40c; universal and sheared plates, 6¼ to 24 inches inclusive, 1.30c; over 24 inches, 1.40c base.

Bars.—Specifications on contracts for steel bars placed earlier in the year are heavy, the agricultural implement manufacturers in the West ordering large tonnages to fill out their depleted stocks. The Eastern bar iron producers have established a new basing price at 1.30c, Pittsburg, for the eastern trade, although practically all the local business is being placed on the basis of 1.25c. We make the following quotations: Bar iron, 1.25c to 1.30c, Pittsburg; hoops, 1.55c, and bands 1.35c, both taking bar extras. Bessemer and open-hearth steel bars, 1.30c; plow and cultivator beams, 1.30c, net; channels, angles, zees and tees, under 3 inches, 1.40c; the following differentials are maintained on steel: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance.

Sheets.—Demand for sheets is fair, and almost the entire tonnage is being placed on the basis of 2.10c for 28 gauge. An occasional order that is very desirable is accepted at 2c, but this is out of the ordinary. We make the following quotations on black sheets, 25 bundles and over; No. 8, 1.60c; No. 9, 1.65c; Nos. 12 to 14, 1.70c; Nos. 15-17, 1.75c to 1.80c; Nos. 18-21, 1.85c to 1.90c; Nos. 22-24, 1.95c; Nos. 25-26, 2c; No. 27, 2.05c; No. 28, 2.10c to 2.15c; No. 29, 2.35c to 2.40c; No. 30, 2.50c to 2.55c; Galvanized: Nos. 12-17, 2.20c to 2.25c; Nos. 18-21, 2.35c to 2.40c; Nos. 22-24, 2.50c to 2.55c; Nos. 25-26, 2.65c to 2.70c; No. 7, 2.90c; No. 28,

3.10c; No. 29, 3.45c to 3.50c; No. 30, 3.85c to 3.90c.

Wire and Wire Nails.—Practically no shading on wire products and nails is reported in this market, although general cutting continues to be reported from the West. Jobbers are being induced to lay in heavy stocks, and are doing so, at the low prices that are being made as an inducement. We make the following quotations: Wire nails, jobbers' carload lots, $1.60; retailers' carloads, $1.65, and less than carloads, $1.75; painted barb wire, $1.75 to jobbers in carloads; retailers' carloads, $1.80, and less than carloads, $1.90, with 30 cents for galvanizing. Annealed smooth fence wire is held at $1.45, with the usual differentials to retailers for carloads and less than carloads. Quotations are all f. o. b. Pittsburg, 60 days, with 2 percent discount for cash in ten days. Iron and steel cut nails are held at $1.65 to $1.70.

Merchant Steel.—Demand for shafting, while fair, is by no means as great as the mills would desire, and none of the plants are operating near their full capacity. Until there is an increase in new construction, and more buying of machinery, the shafting manufacturers are not anticipating any great increase in demand. We make the following quotations: Toe calk, 1.90c; carriage spring steel, 1.75c; tire steel, 1.50c to 1.55c; plow steel, 6 inches and under, 1.25c for Bessemer and open-hearth; plow slabs, ¼ inch and heavier, 1.60c. Drawn and cold rolled shafting is held at 52 percent off in carload lots and 47 off in less than carload lots.

Pipes and Tubes.—Several large orders for line pipe for gas lines are pending and will be closed before the end of the week. Demand for merchant pipe is light, and shading continues to be reported. Discounts to consumers, carload lots, f. o. b. Pittsburg, plus freight to destination according to Tube Rate book, are as follows:

MERCHANT PIPE.

	Steel.		Iron.	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ inch	71	55	69	53
⅜ and ½ inch	75	63	78	61
¾ to 6 inches	79	69	77½	67½
7 to 12 inches	74	59	72½	57
Extra Strong Plain Ends.				
⅛ to ¾ inch	64	52	62	50
½ to 4 inches	71	59	69	57
4½ to 8 inches	67	55	65	53
Double extra strong plain ends, ½ to 8 inches	60	49	58	47

MERCHANT BOILER TUBES, LESS CARLOADS, 22 FEET AND UNDER.

	Steel.	Iron.
1 to 1½ inch	48	43
1¾ to 2¼ inches	60	43
2½ inches	62	48
2¾ to 5 inches	68	55
6 to 13 inches	60	43

Old Material.—The demand for cast scrap is somewhat better and dealers have advanced prices to $11 and $11.50 a ton. Demand for heavy melting stock is not as great as earlier in the month, and mills are offering lower prices, one large consumer offering to buy all offerings at $11, while dealers refuse to consider anything below $12. We revise quotations, gross tons, as follows: Re-rolling rails, $12 to $12.50; re-melting rails, $11.50 to $12; low phosphorus melting stock, $15 to $15.50; sheet scrap, $9 to $9.50; No. 1 wrought, $12 to $12.50; cast iron borings, $6 to $6.50; No. 1 cast, $10 to $10.50.

Coke.—Demand for foundry coke is better, but low prices continue to prevail. Several interests in the old Connellsville region are offering their product as low as $1.65, and many of the plants are selling at $1.75. There is little buying of furnace coke, practically all of the independent interest having covered several months ago for deliveries extending through the last half. Strictly Connellsville furnace coke continues to be held on the basis of 1.35c to 1.40c. During the week ending Sept. 17, the production of the upper Connellsville region amounted to 209,791 tons and the lower region produced 60,470 tons. There are now about 6,800 ovens idle in the two regions as compared with over 11,000 early in August.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, Sept. 27.

Except for continued activity in pig iron and the lighter forms of finished material, this market might be classed as a dull one. Those products affected by the recent reductions in prices show no material selling improvement, and the situation is a distinct disappointment to producers. The growing demand for pig iron is the brightest feature of the local market. Inquiries in the past week have aggregated a greater tonnage than has been offered here for months. These range from 10,000 tons downwards, and several call for deliveries extending through the greater part of the first half of next year. Merchant pipe is also in good demand, jobbers sending in large specifications against their contracts. Other tubular goods, while nominally active, are without noteworthy interest. Dealers in wire products continue to press manufacturers for shipment, and the entire output of local mills goes into immediate consumption. Sheets are showing signs of new life, and while some cutting of prices is still being done by several independent interests, that market as a whole is decidedly better. The movement in scrap seems to have come to an end due to the failure of dealers to market the large tonnages recently bought at fancy prices from railroads. The latter interests are now reoffering for sale several lots for which they have received no shipping instructions, and prices are down several points below the quotations of a week ago. Local bar iron interests have failed to maintain the advance of $1 a ton on bar iron announced last week, and are again quoting $1.35 except on orders for carload lots and less, for which $1.40 is obtained. The cut in steel bars of $1 a ton and the reduction in billets to the basis of $19.50 Pittsburg, made last week, has done much to clear the atmosphere and put the market on a sound healthy basis. The former products is now quoted locally at $1.46½, and billets at $22.50, the Chicago price being obtained by adding the $3 freight rate from Pittsburg to Chicago to the Pittsburg basing price. From now on billets will be sold on the Pittsburg basis, plus the freight rate to point of delivery. Independent mills are shading the new prices on both these materials as well as on structural steel and plates, but only enough to get the business offered. Light rails are active and prices have a stiffening tendency. Standard sections are without life, both as to specifications and new business.

Pig Iron.—The buying movement in pig iron grows. Each week this month has seen a healthy improvement over the seven days preceding, and the tonnage in the market during the week under review runs well up. The inquiries have been for lots as large as 10,000 tons, though the average was for 1,000 and 2,000 tons. Not all of this tonnage has been let, and it is doubtful, except in the case of Northern furnaces, if producers will permit melters to contract for any such large amounts. Southern producers are decidedly averse to selling much iron for future deliveries at present prices, one large interest in the Birmingham district declining to sell more than will meet the current wants of their customers. Under no consideration will these furnaces sell for delivery in the coming year. Higher prices are expected to be realized after Jan. 1, and there is a strong disposition in the South to store iron at 3 percent interest rather than load up with further $9.50 business. Northern furnaces have been active in the week, taking the greater portion of the tonnage offered. A part of this has been for delivery in the first half of 1905, for which 50 cents a ton above present prices is obtained. Local No. 2 foundry is now firm on the basis of $13.50 Chicago, while malleable pig has been advanced to $14 Chicago. Some tonnage has been let to local interests for the latter product, though all for this year's delivery. The Iroquois Iron Co. started up its "B" furnace last week this stack having been banked since last June. The product of this furnace is sold for several months ahead. The stock of iron which the Iroquois Iron Co. had in its yard six weeks ago is being rapidly depleted, and at the present rate of consumption will last but a short while longer. High silicon irons have shared in the brisk movement of the past few weeks, and the tendency is to advance prices on these grades. Our quotations follow:

Lake Superior Charcoal	$ 15 00
Northern Coke Foundry No. 1	14 00
Northern Coke Foundry No. 2	13 50
Northern Coke Foundry No. 3	13 00
Northern Scotch Foundry	15 00 to 15 50
Ohio Strong Softeners No. 1	14 50 to 15 00

Ohio Strong Softeners No. 2	14 00 to 14 50
Southern Coke Foundry No. 1	13 65
Southern Coke Foundry No. 2	13 15
Southern Coke Foundry No. 3	12 90
Southern Coke Foundry No. 4	12 65
Southern No. 1 Soft	13 65
Southern No. 2 Soft	13 15
Southern Gray Forge	12 65
Southern Mottled	12 40
Southern Silveries (4% to 6% Silicon)	14 85 to 15 85
Jackson Co. Silveries (8% to 10% Silicon)	17 80 to 18 30
Alabama and Georgia Car Wheel	18 85 to 19 35
Malleable Bessemer	14 00
Alabama Basic	13 15 to 13 40

Billets.—The reduction in the price of billets announced last week has brought out a number of inquiries, though all for small lots. Competition is keen for the business offered, and several interests are reported to be shading prices. The cut made last week makes a reduction in local prices of $1.50 on billets, and 50 cents on sheet and tin bars. We quote Chicago prices on Bessemer and open-hearth billets, 4 x 4 and larger, up to .25 carbon, $22.50; up to and including .60 carbon, $1 extra. Billets 3⅞ in. and smaller, and sheet and tin bars, $24.50. Wire rods, $26 to $27 Pittsburg.

Bars.—The reduction in the price of steel bars made last week, amounting to $1 a ton, was not made with the hope of stimulating demand for this material, but for the purpose of equalizing the prices of the various steel products. All the large consumers had already covered for their requirements, and the increase to the week's sales beyond what was expected has not been of great proportions. Specifications, however, have shown a great improvement and an active fall and winter trade is now looked for. Makers of bar iron have not been able to maintain the $1 advance announced last week, except on carloads and less, and 1.35c is now quoted on tonnages greater than the foregoing. Shipping instructions on lots against old contracts have been coming in briskly, and mills have plenty of tonnage on their books. Small angles rolled from old rails continue in good demand. Prices are stiffening as the result of the increased cost of old rails, and 1.25c is now the best that can be done in this market. There is a good demand for soft steel angles and hoops. We quote Chicago delivery, as follows: Iron bars, 1.35c to 1.40c; soft steel bars, 1.40c to 1.46½c; soft steel angles, less than 3 x 3, 1.56½c; hoops, 1.71½c. On small lots from store, we quote iron bars, 1.70c to 1.75c base full extras; steel bars, 1.70c to 1.80c base half extras; hoops, 2.10c rates, full extras.

Sheets.—The Inland Steel Co. now contemplates starting up its sheet mill as an open mill in the latter part of October. Demand in the past week has shown a healthy improvement, though several independent interests are reported to be still cutting prices from 50 cents to $1 a ton. With this reservation, we quote one pass, cold rolled, blue annealed sheets, carload lots, mill shipments, Chicago delivery, as follows: Nos. 9 and 10, 1.71½c to 1.76½c; Nos. 11 and 12, 1.76½c to 1.81½c; Nos. 13 and 14, 1.81½c to 1.86½c; Nos. 15 and 16, 1.91½c to 1.96½c. On box annealed, one pass, cold rolled: Nos. 18 and 20, 2.01½c to 2.06½c; Nos. 22 and 24, 2.06½c to 2.11½c; Nos. 25 and 26, 2.11½c to 2.16½c; No. 27, 2.16½c to 2.21½c; No. 28, 2.26½ to 2.31½c; No. 29, 2.41½c to 2.46½c; No. 30, 2.51½c to 2.56½c. We quote lots from jobbers' stocks as follows: No. 10, 1.90c to 2c; No. 12, 1.95c to 2.05c; No. 14, 2c to 2.10c; No. 16, 2.10c to 2.20c; No. 18, 2.20c to 2.30c; No. 20, 2.25c to 2.35c; No. 22, 2.30c to 2.40c; No. 24, 2.35c to 2.45c; No. 26, 2.40c to 2.50c; No. 27, 2.50c to 2.60c; No. 28, 2.60c to 2.70c; No. 29, 2.70c to 2.80c. Galvanized sheets are strong, and we quote Pittsburg discounts, f. o. b. mill, 80 and 5 to 80 and 10. For shipment from stock, we quote heavy gauges and wide widths, 75 and 5 to 75 and 10 percent; for light gauges, 75, 10 and 5½ percent to 80 percent.

Structural Steel.—Business continues light and with no improvement over the condition of a week ago. Several building projects calling for about 5,000 tons of structural shapes are pending, but there is no knowledge as to when these contracts will be let. We quote association prices, carload lots, Chicago delivery, as follows: Beams and channels, 15 in. and under, 1.56½c; angles, 3 to 16 in. inclusive, 1.56½c; zees, 3 in. and over, 1.56½c; tees, 3 in. and over, 1.61½c. On lots from store, we quote beams, channels and angles, 3 x 3 and larger, 1.80c to 1.90c; beams, 18, 20 and 24 in., 10c extra; tees, 5c extra.

Plates.—The demand for plates has fallen off and the market is in as apathetic a state as it was before the change in prices. Some cutting is being done by several independent interests, though only to a point that will bring them the business offered. With this reservation, we quote carload lots for Chicago delivery, as follows: Tank steel, ¼ in. and heavier, 24 in. wide and under, rectangular plates only, 1.46½c base; over 24 in. to 100 in. wide, 1.56½ base; flange steel, 1.66½c base; marine steel, 1.76½c base, all full extras. Plates, 3-16 in. thick, $2 extra; gauges 7 and 8, $3 extra; No. 9, $5 extra. Less than carload lots, 5c extra. Prices from store have also been changed, and we quote tank steel, ¼ in. and heavier, 1.80c to 1.90c; 3-16, 1.90c to 2c; No. 8, 1.90c to 2c; flange steel, 2.05c to 2.15c.

Rails and Track Supplies.—There is little change in the rail situations. Light sections are in good demand and prices show a tendency to stiffen. Standard rails are quiet, both specifications and orders being of small volume. We quote as follows: Heavy sections 500 tons and over, $28; less than 500 tons to carload lots, $30; less than carload lots, $32; second quality rails, $27; light rails, $22 to $24; track supplies, f. o. b. Joliet mill, angle bars, 1.30c; spikes, first quality, 1.60c; track bolts, 3¼ x ¾, with square nuts, 2.20c to 2.30c per 100 lb.; with hexagon nuts, 2.35c to 2.45c.

Merchant Steel.—Prices of several of the products listed below have been reduced $1 a ton as a result of the change in prices of steel bars. There is a fair demand for new tonnage, and a marked increase in specifications. We quote carload lots, mill shipments, Chicago delivery, as follows: Spring steel, 1.85c; sleigh shoe, flat sizes, 1.51½c; concave and convex, 1.60½c to 1.71½c; cutter shoe, 2.25c; smooth finished machinery steel, 1.71½c; smooth finished tire, 1.66½c; plow steel, 2.20c and upwards, according to quality; toe calk steel, 2.01½c. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and up; cold rolled shafting, 52 percent from list in carload lots, and 47 percent discount in less than carload lots.

Merchant Pipe.—Specifications have been received from jobbers in good volume during the week under review. The outlook is very gratifying to producers. There are no changes in prices, and we quote carload lots, mill shipments, random lengths, f. o. b. Chicago as follows:

MERCHANT PIPE.

	Steel Pipe		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ and ¼ inches	69.35	53.35	67.35	51.35
⅜ and ½ inches	73.35	71.35	71.35	69.35
¾ to 6 inches	77.35	67.35	75.85	65.85
7 to 12 inches	72.35	57.35	70.85	55.85

Boiler Tubes.—There is a fair demand, which is about all that can be said of the local market. Prices are without change, and on carload lots, Chicago delivery, mill shipments, we quote as follows:

BOILER TUBES.

	L. W. Steel. Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ inch	46.35	41.35	52.35
1⅝ to 2¼ inch	58.35	41.35	40.35
2½ inch	60.35	46.35	43.35
2¾ inch to 5 inch	66.35	53.35	Up to 4 inches.
6 to 13 inch	58.35	41.35	50.85

The following are the agreed discounts from store:

	Steel.	Iron.	Seamless Steel.
1 to 1½ inches	42½	37½	40
1⅝ to 2¼ inches	52½	35	37½
2½ inches	55	37½	40
2¾ to 5 inches	62½	47½	47½
6 inches and larger	52½	35	..

Cast Iron Pipe.—The only contract of interest pending is one of 500 tons for the city of Eveleth, Minn. Routine business, however, has been good, making the week's tonnage of fair proportions. Prices are firm with a tendency to higher figures. We quote carload lots, Chicago delivery as follows: 4-in. water pipe, $25.50; 6-in. to 12-in., $24.50; larger sizes, $24; gas pipe, $1 a ton higher.

Wire Products.—Demand for fencing and wire nails continues without diminution, the entire output of Western interests going into immediate consumption. Prices are without change, and we quote carload lots to jobbers, mill shipments, Chicago delivery, as follows: Wire nails, 1.75c; painted barb wire, 1.90c; galvanized barb wire, 2.20c; smooth annealed wire, 1.60c; smooth galvanized wire, 1.90c; polished staples, 1.85c; galvanized staples, 2.15c. Less than carload

lots to jobbers are 5 cents higher than above prices. The retail trade is quoted 5 cents extra over the foregoing on carload lots, and 10 cents extra on less than carload lots. Bale ties are unchanged at 82½c and 5 percent discount f. o. b. Waukegan, Ill., on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet or DeKalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

Foundry Coke.—The market has materially strengthened in the past seven days and prices are firmer. With the approach of cold weather, the demand for coke has grown heavier, and producers are experiencing a greatly improved demand. We quote coke from Wise County, Va., $2 at the ovens, or $4.25 Chicago. Coke from the Pocahontas and New River districts, the freight rate of which to Chicago is $2.65, as offered in this market on the basis of $1.65 to $1.75 at the ovens. Standard 72-hour Connellsville grades are firm at $2 at the ovens, or $4.65 Chicago. Solvay coke from the Milwaukee plant is being offered at $4.50 to $4.75 Chicago.

Old Material.—A puncture seems to have been made in the inflated prices of scrap, and quotations on several products are 50 cents below what they were a week ago. Dealers have had some trouble in the past ten days in disposing of the heavy tonnages which they had bought from railroads at fancy prices, and the bull movement has the appearance of having reached an untimely end. There has been some buying of heavy melting steel by the two local consumers, and there has also been a fair demand for old rails; but beyond these two products the market has been without activity. We have revised our prices, and quote dealers selling prices, gross tons, as follows:

Old iron rails	$15 75 to 16 25
Old steel rails (4 feet and over)	11 50 to 12 00
Old steel rails (less than 4 feet)	10 50 to 11 00
Relaying rails, subject to inspection	21 50 to 22 50
Relaying rails for sidetracks	18 00 to 20 00
Old wheels	10 50 to 11 00
Heavy melting steel	9 50 to 10 00
Mixed country steel	7 00 to 7 50
Low phosphorus scrap (.04 and under)	11 00 to 12 00

The following quotations are for net tons:

No. 1 R. R. wrought	11 75 to 12 25
No. 2 R. R. wrought	10 75 to 11 25
Shafting	12 50 to 13 00
Dealers' Forge, No. 1	9 00 to 10 00
Wrought pipe and flues	8 00 to 8 50
No. 1 cast, 150 lb. and less	10 00 to 10 50
No. 1 mill	6 00 to 6 50
Country sheet	5 00 to 5 50
No. 1 boilers, cut	8 00 to 8 50
Boiler punchings	9 50 to 10 00
Iron car axles	16 00 to 16 50
Steel car axles	13 50 to 14 00
Iron axle turnings	7 50 to 8 00
Steel axle turnings	7 50 to 8 00
Cast borings	4 25 to 4 50
Mixed borings, etc.	4 25 to 4 50
Wrought turnings	6 50 to 7 00
Machine shop turnings	6 50 to 7 00
Railroad malleable	9 00 to 9 50
Agricultural malleable	9 00 to 9 50
Stove plate and light cast scrap	9 00 to 9 50
Old iron splice bars	13 00 to 13 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Sept. 28.

Iron Ore.—Owing to the improvement in the grain carrying business, which has decreased the number of vessels seeking ore cargoes, and to the fact that the cost of operating all boats will be increased Oct. 1 on account of wages being raised and other expenses augmented, shippers pretty generally concede the justice of the demand of the vessel owners for an increase in freight rates. The rate from Marquette has been advanced from 55 to 60 cents and it is probable that before the close of the week there will be the same advance of 5 cents in rates from the head of the lakes. Prices of ore are firmer and are tending upward. Old range non-Bessemer sells at $2.75 to $2.85 and non-Bessemer Mesabis usually at $2.50. For Bessemers, old range sell at $3 to $3.35 and Mesabis at $2.75 to $3. A fair number of sales are being made of rather small tonnage, ranging from 5,000 to 10,000.

Pig Iron.—Inquiries show an increasing tendency to cover the early part of 1905, but no sales are made beyond this year, because furnaces will not give quotations which satisfy buyers. Basic is selling at $11.75 at Valley furnace and malleable at $12. In No. 2 foundry, little can be had at less than $12 Valley, but sales are undoubtedly made as low as $11.75, and an order for a large tonnage for prompt shipment would probably show no great strength in the market. Southern iron is firm at $9.25 to $9.50, Birmingham, for No. 2. We quote as follows for Cleveland delivery:

Bessemer	$12 60 to 12 75
No. 1 Strong Foundry	12 85 to 13 00
No. 2 Strong Foundry	12 60 to 12 85
No. 2 Foundry	12 35 to 12 50
No. 2 Southern	12 10 to 12 35
Gray Forge	11 85 to 12 00
Gray Forge, Southern	12 00 to 12 15
Lake Superior charcoal	14 50 to 15 00

Finished Material.—There has been a gratifying demand for structural material since the recent reduction in price, showing that new construction was postponed awaiting lower prices. While in other lines, such as steel bars, now quoted at 1.39½c, Cleveland, for basic and 1.44½c for open-hearth, and sheets, the increase in new orders is not large, there is increased willingness of buyers to contract for their requirements for some time in the future, but producers are not anxious to do so. The principal manufacturer of sheets, which reports that its business is excellent, is not ready to make long time contracts except in some instances to old customers. Several of the leading makers of bar iron are working together to maintain a price of 1.30c Youngstown. While there is no ironclad agreement, they say there is no profit in bar iron at 1.25c and hope to maintain the higher price. Prices of sheets have not been revised, as it is asserted that the recent reduction in sheet bars was anticipated in previous revisions. The prices of the principal producers through jobbers are as follows, Cleveland delivery, the freight from Pittsburg being 9½ cents: Mill sales of black sheets in carload lots, No. 10, 1.64½c; No. 11-12, 1.69½c; No. 14, 1.79½c; No. 16, 1.89½c; No. 27, 2.14½c; No. 28, 2.24½c. Galvanized, mill sales, No. 14, 2.24½c; No. 16, 2.34½c; No. 18-20, 2.49½c; No. 22-24, 2.64½c; No. 25-26, 2.84½c; No. 27, 3.04½c; No. 28, 3.24½c. Out of stock, black sheets: ¼-in., 1.90c; 3-16-in., 2c. Blue annealed: No. 10, 2.05c; No. 12, 2.10c; No. 14, 2.15c; No. 16, 2.25c. One pass cold rolled: No. 18-20, 2.35c; No. 22-24, 2.40c; No. 26, 2.45c; No. 27, 2.50c; No. 28, 2.60c; No. 30, 3c. Galvanized out of stock: No. 16, 2.60c; No. 18-20, 2.70c; No. 22-24, 2.85c; No. 26, 3.05c; No. 27, 3.25c; No. 28, 3.45c; No. 30, 4.25c.

Old Material.—Dealers who purchased large quantities of scrap in the belief that prices would advance are holding their stocks at prices which do not meet the views of buyers and the result is a very dull market. It is pointed out that, a few weeks ago, when the mills placed orders, they paid a higher price than they had previously and it is predicted that still higher prices will prevail. For the past week, prices show no change. We quote as follows, gross tons, Cleveland delivery:

Old iron rails	$15 00 to 15 50
Old steel rails (over 6 feet)	12 00 to 13 00
Old steel rails (under 6 feet)	11 00 to 12 00
Old car wheels	10 00 to 11 00
Steel boiler plate	9 00 to 10 00
Malleable iron (railroad)	10 00 to 10 50
Malleable iron (agricultural)	8 00 to 9 00
Heavy steel	10 00 to 11 00

We quote as follows, net tons:

No. 1 R. R. wrought	$10 50 to 11 50
No. 1 busheling	9 50 to 10 00
No. 1 machine cast	9 50 to 10 50
Iron axles	16 00 to 16 50
Axle turnings	7 00 to 8 00
Wrought turnings (free from cast)	6 00 to 6 50
Grate bars	7 00 to 8 00
Pipes and flues	8 00 to 8 50
Tank iron	7 50 to 8 00
Hoop and band iron	5 00 to 5 50
Sheet iron	4 00 to 5 00
Wrought drillings	6 00 to 6 50
Stove plate	8 00 to 9 00
Steel axles	12 00 to 14 00
Cast borings	5 00 to 5 50

CINCINNATI.

Sept. 27.

The coke market presents nothing new either as to movement or prices. Foundry coke is quoted at $1.90 to $2.05 f. o. b. Connellsville. The movement is rather moderate.

Pig Iron.—Some of the large orders pending last week were closed up in the week under review, and in the aggregate there was a fair volume of business done through the agencies here. Not much new business has come into sight during the week; still there are a few good inquiries. One

consumer is in the market for 500 tons of basic and another wants 2,000 tons of gray forge. There is an inquiry from Michigan for 500 tons of Southern No. 2 foundry. One sale of about 1,000 tons of Southern irons was made at $9.50 for No. 2, $8.75 for No. 4 foundry and $8.50 for gray forge Birmingham. A large machinery and electrical concern is asking for prices on 10,000 tons for deliveries beginning next year. The placing of orders for 2,000 tons of Northern iron in Central Ohio last week brought out some lower prices than were generally looked for and a shade under $11.50 at furnace was done on some of this business. There appears to be but little Southern iron now on the market below $9.50 Birmingham as a basis. The rank and file of buyers have shown no more disposition to come into the market than for several weeks past. The general run of small orders that are being placed to cover present needs shows a slight increase, but nothing of a really encouraging nature has developed. Trade sentiment is hopeful. The Southern strike situation shows but little change. The operators are getting more men to work every day and with the coke bought from the outside districts there is no further curtailment of the output and there is some talk of more furnaces going in before long.

We quote in carload lots f. o. b. Cincinnati:

Southern Foundry No. 1	$12 50 to 12 75
Southern Foundry No. 2	12 00 to 12 25
Southern Foundry No. 3	11 50 to 12 00
Southern Foundry No. 4	11 00 to 11 25
Southern Foundry No. 1 soft	12 50 to 12 75
Southern Foundry No. 2 soft	12 00 to 12 25
Gray Forge	11 00 to 11 25
Northern Foundry No. 1	13 15 to 13 65
Northern Foundry No. 2	12 65 to 13 15
Southern car wheel iron	16 25 to 16 50

Finished Material.—The reduction in steel bars and the general reports as to the tendency of prices is bringing the buying to a condition covering only current wants. So close is this policy being pursued that orders have been numerous but of small specifications. Manufacturers are buying only to cover needs for work in hand, and are disposed to contest prices on all orders. In spite of this condition of affairs there is no disposition to shade prices on iron bars and they hold steady at recent quotations. Bar iron is quoted at 1.35c; steel bars at 1.43c, half extras, with dealers quoting 1.60c to 1.75c for iron and steel out of store. Galvanized sheets are at 75 and 10 to 75, 5 and 2½ percent off. We quote black sheets, No. 27, at 2.25c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.60c; No. 27, 2.50c; No. 16, 2.30c; No. 14, 2.20c; No. 12, 2.10c; No. 10, 2c. Tank plates are dull and sell out of store at 2c for ¼-in., 3-16-in., No. 8 and No. 10. Beams and channels are quoted at 2c from stock and angles at 1.90c to 2c for base sizes.

In merchant pipe the independent mills are still underselling the schedule of the leading interest, but the National is making no effort to meet this competition and is firmly holding to the schedule. The demand is only fair and there is a rather moderate inquiry.

MERCHANT PIPE.
(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛, ¼ inch	69.7	53.7	67.7	51.7
⅜, ½ inch	73.7	61.7	71.7	59.7
¾ to 6 inch, inclusive	77.7	67.7	76.2	66.2
7 to 12 inch, inclusive	72.7	57.7	71.2	55.7

BOILER TUBES.

	Steel Percent.	Iron Percent.
to 1⅛ inch	41.2	37.7
1¼ to 2¼ inch	54.2	36.7
2½ inch	56.7	41.7
2¾ to 5 inch	63.2	49.2
6 to 13 inch	54.2	36.7

Old Material.—The market continues quiet with no change in prices. Dealers report but little demand. There seems to be slight change in the situation from week to week. We quote:

Old No. 1 railroad wrought, net tons	$11 00 to 11 50
Cast machine and foundry, net tons	9 50 to 10 00
Old iron rails, gross tons	12 50 to 13 00
Old steel rails, gross tons	9 50 to 10 00
Old short lengths, gross tons	10 00 to 10 50
Old iron axles, net tons	13 50 to 14 00
Stove plate, net tons	6 00 to 6 50
Wrought turnings, net tons	6 00 to 6 50
Cast borings, net tons	3 00 to 3 50

In answer to inquiries made in view of the death of Archer Brown, it is stated that the firm of Rogers, Brown & Co. will be continued by the surviving partners under the present name.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., Sept. 27.

The improving conditions noted in our previous report continued during the past week. The aggregate sales were larger than in the week previous, with Northern irons decidedly in the lead. For some time past activity in the latter has been followed by a weakening in prices, but this tendency has been conspicuous by its absence during the past fortnight. The sales made recently have been made up of many large lots, several going as high as 1,000 tons each. While delivery covers the balance of the year, sales agents report many inquiries calling for delivery the early part of next year. There is no doubt that some good contracts could be closed for this delivery, provided the furnaces would make them on the basis of present prices, but this they are unwilling to do, believing that general conditions by that time will be in their favor. Southern No. 2 foundry is still being quoted at $9.50 Birmingham, delivery the remainder of the year, but few sales are reported. The miners' strike is still a menacing feature to the Southern market, particularly as regards delivery, although quick shipment is being made on good sized orders. New York quotations at tidewater follow: Northern No. 1 X, $14.50 to $15; No. 2 X, $14 to $14.50; No. 2 plain, $13.50 to $14; Southern No. 1 foundry, $13.50 to $13.75; No. 2 foundry, $13 to $13.25; No. 3 foundry, $12.50 to $12.75; No. 4 foundry, $12.25 to $12.50.

Finished Iron and Steel.—The structural material market for the past week was a little more active, with the strange feature of orders for large lots being more numerous than for small ones. It is now several weeks since the reductions in prices were made, and when subsequent developments are mentioned, it is always in terms of disappointment. Railroad work is particularly backward. The American Bridge Co. closed a contract during the week for 1,500 tons from the Southern Railway Co., and has all but closed a contract for 1,800 tons for an office building in Cincinnati. Independent companies got some good contracts recently also. Among them was one for 4,000 tons from the Baltimore & Ohio road, for its Washington terminal. This was taken by Milliken Bros., of this city. The Phœnix Bridge Co. got an order from the Southern Railway Co. aggregating 3,000 tons. In plates, sheets, and bars, general conditions are the same as they have been for weeks past, new business in each being very small. New York prices at tidewater follow: Angles, 3 to 6 in. x ¼ in. and heavier, 1.54½c; beams, 3 to 15 in., 1.54½c; channels, 3 to 15 in .,1.54½c; beams, 18, 20 and 24 in., 1.64½c; tees, 3 x ¼ in. and heavier, 1.59¼c; plates, carloads, tank, 1.54½c; flange, 1.64½c; marine and ordinary fire box, 1.74½c; refined iron and soft steel bars, 1.44½c; sheets, in carload lots New York, No. 28, black, 2.25c to 2.30c; galvanized, 3.25c to 3.30c.

Old Material.—The market during the past week has been quiet, with holders less anxious to part with their stocks. Prices, if anything, are a little firmer than they have been. Expectations are widely entertained that a change in the market for the better is imminent. Prices f. o. b. cars follow:

Old iron rails	$14 00 to 14 50
Old steel rails, long lengths	11 50 to 12 00
Old steel rails, short pieces	11 00 to 11 50
Relaying rails	19 00 to 20 00
Old car wheels	11 50 to 12 50
Old iron car axles	17 00 to 18 00
Old steel car axles	14 00 to 14 50
Heavy melting steel scrap	11 50 to 12 00
No. 1 railroad wrought scrap	11 50 to 12 00
Iron track scrap	10 50 to 11 00
Wrought pipe	7 75 to 8 25
Ordinary light iron	4 50 to 5 25
Cast borings	3 50 to 4 00
Wrought turnings	5 50 to 6 00
No. 1 machinery cast	9 00 to 10 00
Stove plate	7 75 to 8 25

PHILADELPHIA.

Sept. 27.

Conditions seem to be little better than they were before the recent reductions in prices of finished material. There is, however, better feeling and inquiry indicates that business will improve after the first of the new year.

Pig Iron.—The demand is rather uneven, but there seems to be a good undertone. The insistence of foundries on prompt shipments shows that stocks in consumers' yards are low. When the Southern furnaces resume

in full, there is likely to be an overproduction. Makers of pig iron declare that they can not possibly sell at lower prices, but buyers still hesitate. We quote as follows for Philadelphia and nearby deliveries: No. 1 X foundry, $14.75 to $15.25; No. 2 X foundry, $14.25 to $14.50; No. 2 plain foundry, $13.50 to $13.75; standard gray forge, $12.75 to $13.00; ordinary gray forge, $12.50 to $12.75; basic, $12.75 to $13.00.

Steel.—There is a slightly better demand and those in need of billets will probably place their orders soon, as lower prices are not expected.

Finished Material.—While recent reductions have brought out some new business, the result is, on the whole, disappointing. Bar iron has been reduced to 1.30c, Pittsburg. We quote for car load lots and more as follows: Refined bar iron or soft steel, 1.43½c to 1.48½c; tank or boiler plates, 1.43½c; beams, cannels or angles, 1.43½c to 1.48½c.

Old Material.—There is a moderate inquiry and prices are steady. Holders are inclined to hold for full prices. We quote as follows: No. 1 steel scrap, $11.75 to $12.25; low phosphorus scrap $16 to $16.50; old steel axles, $15 to $15.50; old iron axles, $18 to $18.50; old iron rails, $15.50 to $16; old car wheels, $11.75 to $12.50; choice railroad No. 1 wrought, $14.50 to $15; machinery cast, $11.50 to $12; No. 2 light scrap (forge), $10 to $10.50; No. 2 light scrap (ordinary), $8 to $8.50; axle turnings, $9 to $9.50; wrought turnings, $8.50 to $9.; cast borings, $6.50 to $7; stove plate, $9 to $10; wrought iron pipe, $11 to $11.50.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., Sept. 27.

Pig Tin.—After having been quiet all the week, the market today became more active, with prices becoming firmer. It is thought that the Banca sale on Thursday will result satisfactorily. The London market for the week was dull, with prices showing a tendency to sag. Closing prices today follow: Spot, September and October, 27.87½c to 28c. London's closings today follow: Spot, £127 12s 6d; futures, £128 2s 6d. Arrivals at Atlantic ports for the month to date aggregate 1,855 tons, with 1,460 tons afloat.

Copper.—Although prices are unchanged, underlying conditions in the market were not as satisfactory as during the week previous. Consumers do not think any appreciable advance in prices is probable in the near future, and are only meeting immediate requirements in consequence. The London market for the week was featureless, with prices a trifle lower. Today's closings follow: Lake, 12¾c to 13c; electrolytic, 12¾c to 12⅞c; casting, 12½c to 12⅝c. London's closings today follow: Spot and futures, £58 2s 6d. Exports for the month to date amount to 15,592 tons.

Lead.—Business is quiet, with prices remaining at 4.20c to 4.30c for spot. St. Louis is slightly stronger at 4.12½c to 4.15c. London advanced to £11 17s 6d.

Spelter.—Is dull and unchanged at 5.10c to 5.20c. St. Louis is a trifle firmer at 5c. London cables £22 7s 6d.

Antimony—Both Cookson's and Hallett's are 7c asked. Other grades are 6c asked.

Quicksilver.—We quote $40 per flask of 76½ pounds in lots of 100 flasks. London is £7 15s.

Nickel.—Sales are made at 40c to 47c for large lots down to a ton, and at 50c to 60c for smaller quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, Sept. 27.

Demand for metals has shown a marked improvement in the week under review. Trading in copper has been given an impetus, owing to the nearness of the close of lake navigation, which in the past has resulted in advances in price, because of the decreased shipments from the mines. Pig tin is also firmer and advancing rapidly in price because of the decreased shipments from abroad. All prices are stiffer than they were a week ago, and are on the upward grade. We quote as follows: Lake copper in carloads, 13⅛c, and for smaller lots, 13⅜c; casting, 12⅞c for carloads, and 13¼c for lesser quantities. Pig tin, 28⅞c to 29¼c, according to quantity. Spelter, 5⅛c to 5⅜c, according to quantity; sheet zinc, 6c for carload lots of 600 lb. casks, and 6.25c to 6.35c for less than carload lots. Pig lead, 4.20c for 50-ton lots; 4.25c for carload lots, and 4.35c for smaller lots.

There is a fair demand for old metals, and prices are firm with an advancing tendency. We quote copper wire and heavy, 11¼c; copper bottoms, 9¾c; copper clips, 10¾c. Red brass, 9¾c; red brass borings, 7⅜c. Yellow brass, heavy, 7¼c; yellow brass borings, 6¼c. Light brass, 5½c; tea lead, 3¾c; zinc, 3.60c.

Successor to the Cramp Steel Co.

The reorganization of the Cramp Steel Co., of Collingwood, Ont., which some time ago suspended operations on account of financial difficulties, has now been completed. The company has secured a new charter of incorporation under the name of the Northern Iron & Steel Co., Ltd., with head offices at Toronto and a capital of $2,500,000. It is authorized to take over the plant of the former company including their right to a bonus of $60,000 voted by the town of Collingwood where the works are located. At an organization meeting held in Toronto, Sept. 22, the board of directors was constituted as follows: John A. Currie, president; Duncan Donald, secretary-treasurer; F. Asa Hall, W. J. Lindsay and John T. Duguid. The movement for reorganization was strongly opposed by Garnett H. Meldrum, of New York, on behalf of the American shareholders who took the matter into the courts, but without avail. It is stated, however, that the board will be increased by the election of a director to represent the interests of the American capitalists concerned, and of another, a practical steel manufacturer, who will manage the production.

The Northern Iron & Steel Co. as at present constituted is in close affiliation with the Imperial Steel & Wire Co., Ltd., of Collingwood, in which the directorate is largely interested. It is stated that the Northern Iron & Steel Co. has extensive orders for steel to be used in the manufacture of wire by the Imperial company, which will keep it busy for some time as soon as it is able to resume operations.

Pullman Works Resume in Part.

Work in the repair shops of the Pullman Co., at Pullman, Ill., was resumed in part last Monday, after an idleness of a couple of weeks. In addition to these shops, the repair plants at Ludlow, Ky., Denver, Buffalo and Wilmington, Del., were also started up on the same day. The Pullman Co. has never made any agreements with labor unions since the Pullman strike of '93, and the shut-down of several days ago was not the outcome of any rupture with labor unions, or connected in any way whatever with labor troubles. Officials of the company state that the suspension was due entirely to lack of business, and the manufacturing shops will remain idle while present conditions continue. No change will be made in the wage scale, except with those who work under the piece system. There will be a revision of this scale, which will result in a reduction of pay for some and a slight increase for others. Several departments at Pullman were ordered closed Tuesday by the city boiler inspector, who condemned 20 boilers, which must be repaired or replaced.

Reference was made in our last issue to the paper of Chas. H. Morgan, of the Morgan Construction Co., Worcester, Mass., read at the Lake Superior meeting of the American Institute of Mining Engineers, his subject being "The Case of Cort." The remains of the pioneer rolling mill inventor were buried in Hampstead, a suburb of London, within 4½ miles of St. Paul's Cathedral, and not in Hampton churchyard, as the types had it last week. There is a movement to have American iron masters place a memorial tablet in the Hampstead churchyard.

The Anderson, Ind., tin plate plant of the American Sheet & Tin Plate Co. was shut down in all departments last week.

EASTERN PENNSYLVANIA.

HARRISBURG, Sept. 27.—Conditions in this section of the state are summed up in the word waiting, even after prices have been readjusted.

Most of the works in the Lower Susquehanna valley are making fair time, but nothing extraordinary. Some few have rush jobs which are being hurried out and others are clearing up orders on hand.

Comparatively few furnaces in this section have resumed, but there are a dozen inside of 100 miles of this city which could be started very soon.

The Pennsylvania Steel Co. will run its rail mill next week, the rest of the plant being in operation and the bridge department on better time than for a while. The company may start another furnace before long.

There is little doing at any of the cut nail works in this part of the state. Some are closed and others are making reduced time. The bar mills are working, however, on fair time.

The Midvale Steel Co.'s improvements at the plant near Philadelphia are reported to be well advanced toward completion.

The state of Pennsylvania has given contracts for bridges as follows: York Bridge Co., Conewago, $23,750; Nelson & Buchanan, Mahoning, $17,945, and National Bridge Co., Penns creek, $43,000. There were twenty-three bidders, some of them Ohio and New York firms. The state has authorized the building of about a dozen additional bridges.

The famous Brown segmental gun has been completed at Reading and will be shipped to Sandy Hook. If it proves a success a factory for building the guns will be established either at Reading or Birdsboro.

The Berks county court has ordered the sale of the Bernville Foundry & Machine Works which have long been in litigation. There are forty-eight heirs to the property. Charles K. Derr, Reading, is master in the case.

Furnace No. 2 at the Pennsylvania Steel Co.'s Steelton plant made 403 tons of iron in one day recently. It is an 80-ft. stack with a 20-ft. bosh.

The Middletown Car Works have a large order for cars for a railroad in the Argentine Republic. The works have also been making cars for Jamaica.

Several of the Lackawanna Iron & Steel Co. furnaces at Lebanon are being overhauled and may be started soon. There is talk of lease or sale to the Pennsylvania.

The Geiser Mfg. Co. is building a new plant at Greencastle, near here, for the manufacture of the Metcalfe gasoline engine. A new foundry is being built. The Geiser and other works at Waynesboro are running on reduced time, although they are turning out a considerable quantity of foreign work.

The Pennsylvania railroad has returned hundreds of men at its car and repair shops at this city and Altoona because of increase in work for them.

The old Bucher furnace at Boiling Springs, over 100 years old, has been bought by a traction company and the grounds used for a park.

The Penn Iron Works have resumed operations at Lancaster after a long idleness. The puddle mill is running full time. The Parkesburg and other mills in that county are in operation again. A better condition is also reported at Chester and in the Schuylkill valley.

The Reading railroad is running its Reading locomotive shops day and night to keep up with work. Recently the men were kept at work on Saturday nights.

The McClintic-Marshall Construction Co., Pittsburg, has received an order from the B. & O. Railroad Co. for 2,000 tons of plate girder bridges. The girder spans vary in length from 75 to 110 ft. That portion of this order to be erected on the Pittsburg Division of the B. & O. will be manufactured at the Pittsburg plant of the company located at Rankin, while that portion to be erected on the Baltimore Division will be manufactured at the Pottstown, Pa., plant of the company.

The furnace of the Belfont Iron Works Co., of Ironton, O., has been blown out. It is the intention of the company to build a new stack in place of the old one.

OBITUARY.

Oliver Williams died at his home in Catasauqua, Pa., September 17. Mr. Williams was born in South Wales, April 23, 1831, and when two years old was brought to this country by his parents, who settled in Schenectady, N. Y. He was educated in the common schools, and afterward attended Allentown academy for one year. He learned the trade of iron molder and worked at it until 1849, when he entered the optical establishment of McAllister & Co., Philadelphia, remaining with them until 1853, when he joined James W. Queen, one of the McAllister firm, in establishing the J. W. Queen Co. In 1855 Mr. Williams moved to Milwaukee, where he roomed for three months with Chester A. Arthur, who afterwards became president of the United States. Mr. Arthur soon returned to New York, and while visiting him in 1858, Mr. Williams met Peter R. L. Hardenberg, who proposed to go to Chicago and open a leather store, which was done. Abraham Lincoln was attorney for the firm. In 1866 Mr. Williams was appointed general manager of the Catasauqua Mfg. Co. and moved to that city, where he lived up to the time of his death. He was also one of the founders of the Bryden Horse Shoe Works, of which he was president. He was also president of the Union Foundry & Machine Co., of Catasauqua. For three years he was president of the National Iron Association; for 15 years president of the Eastern Bar Iron Association and a member of the American Institute of Mining Engineers.

J. McGregor Adams, president of the Adams & Westlake Co., Chicago, died Sept. 17, aged 70 years.

David E. Whiton, founder and president of the D. E. Whiton Machine Co., New London, Conn., died Sept. 11 after an illness of a few days. Mr. Whiton was born in 1825.

George S. Herbertson, founder of the Herbertson Foundry & Machine Co., Cadwallader, Pa., died Aug. 29, aged 57 years. In 1880 his sons entered the firm, and in recent years have conducted the business as J. Herbertson's Sons.

Benjamin F. Ryer, Chicago, for the last ten years western manager of the S. Howes Grain Cleaning Machinery Co., was buried Sunday from his residence, 2169 Washington boulevard.

Personal.

Axel Sahlin, of the London firm of Julian Kennedy, Sahlin & Co., Ltd., is now in the United States and has recently been a visitor at St. Louis.

Albert Ladd Colby, assistant to the president of the International Nickel Co., 43 Exchange place, New York, has just returned to his office thoroughly recovered from the attack of pleuro-pneumonia, which he contracted in St. Louis last July while installing his company's exhibit in the Department of Mines and Metallurgy.

R. L. Richardson, who has been connected with the Pittsburg office of the Westinghouse Electric & Mfg. Co. for the past ten years, has resigned to accept a position with the Allis-Chalmers Co. as general correspondent and salesman in the Pittsburg offices in the Frick building. Mr. Richardson will assume his new duties Oct. 1, in the meantime visiting the St. Louis Exposition.

Martin F. Murphy, formerly business agent of the Iron Molders' Union in Buffalo, and president of the New York Federation of Labor, has accepted the position of general superintendent of the Hewitt Mfg. Co., of Chicago. This company makes a specialty of journal bearings.

Frank J. Hearne, president of the Colorado Fuel & Iron Co., has been in the East and in Pittsburg in the past fortnight.

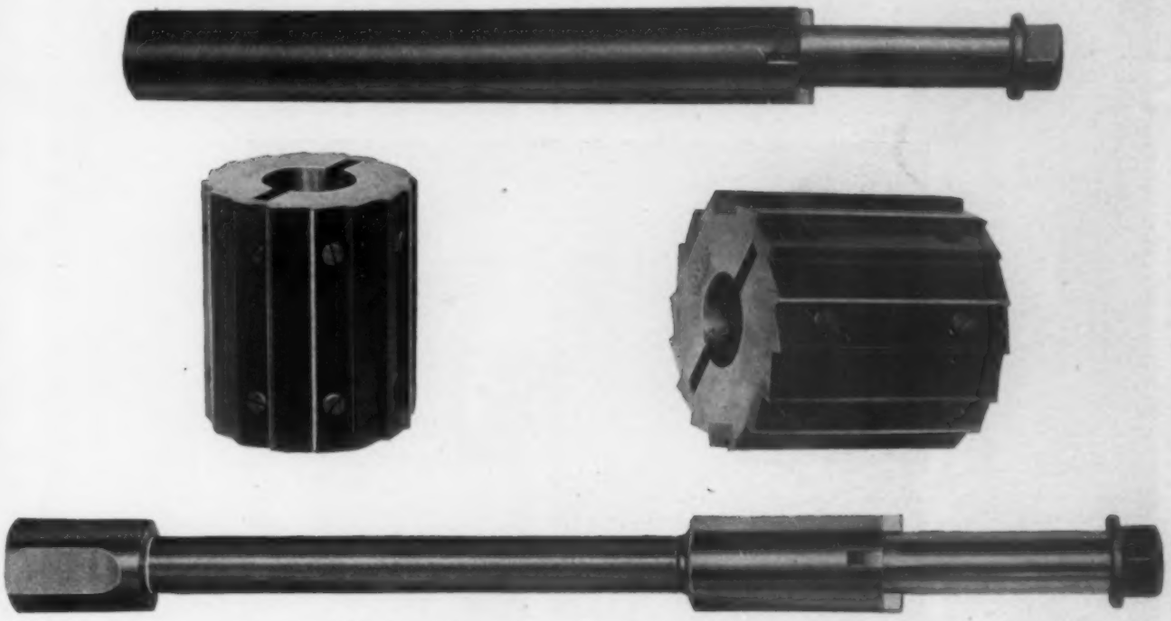
The following bids have been received by the Isthmian Canal Commission for the water pipe and specials, reference to which was recently made in these columns. The price given for pipe is per ton and is per pound for specials: M. J. Drummond, New York, 6 and 8-in. pipe, $29.50; 10 and 12-in., $29; 16 and 20-in., $28.75. U. S. Cast Iron Pipe & Foundry Co., New York, $21.70 for pipe, all sizes; specials, 2½c. R. D. Wood & Co., 6, 8, 10 and 12-in. pipe, $24; 16 and 20-in., $23.25; specials, 2½c. Dimmick Pipe Co., Birmingham, Ala., $29.40 for pipe, all sizes; $55 per ton for specials. Upwards of 4,000 tons of pipe will be contracted for.

THE GISHOLT "SOLID" ADJUSTABLE REAMER.

The new "solid" adjustable reamer is one of the smaller tools manufactured by the Gisholt Machine Co., of Madison, Wis. A demand for this reamer, as with many other tools which have been placed on the market, first arose in the shop now manufacturing them.

The ideal reamer should possess all the solidity of a one-piece tool and yet be constructed so that expansion is possible, in this way providing for wear. This requirement has been met by the arrangement of the reamers shown in the illustration. A special feature in the Gisholt "solid" adjustable reamer is the size and thickness of the blades. Each blade has two cutting edges and the best tool steel is used in their construction. The extra weight and width of stock used in these reamers materially reduces the liability of breakage. The body is of high carbon steel bored and slotted to fit standard reamer arbors. Especial care is taken in building these reamers in order to insure an accurate fit of the blades to the body. The reamers are now manufactured in all standard sizes, in both hand and machine types.

The new catalogue issued by the company also shows a full line of shell reamer arbors, together with an equipment of shell reamer arbors especially adapted for use on the Gisholt turret lathes.



THE NEW REAMER AND ARBORS OF THE GISHOLT MACHINE CO.

Failure of the Aultman Co.

Col. J. J. Sullivan, of Cleveland, has been appointed receiver of the Aultman Co., of Canton, O., manufacturer of harvesting machinery. The application for the receiver stated that the company is insolvent and has an indebtedness of $1,500,000. Assets were not given. The announcement was made that the shops would not be closed, but would be operated to their full capacity. There are 500 men employed by the company. The failure of the Aultman Co. involved the Arctic Machine Co., of which Ernest A. Pflinger, of Akron, was appointed receiver. The Aultman Co. manufactured the output of the Arctic Co. In 1893 the Aultman Co. went into the hands of a receiver, failing in an amount in excess of $900,000. The creditors took charge of the affairs of the company, but were not successful in the business management.

Following the appointment of Col. Sullivan as receiver of the Aultman Co., action was brought in the United States court at Cleveland to force the company into bankruptcy. The plaintiffs in the action are the Upson Nut Co., George Worthington Co., the Bourne-Fuller Co., and the Cleveland City Forge & Iron Co., all of Cleveland. The specific act alleged by the petitioners as constituting an act of bankruptcy, is the consenting on the part of the company to the appointment of a receiver. The claims of the various petitioners in the suit are respectively $3,212.08, $7,680.10, $2,817.48, $3,345.

Ralph R. Bradley has been appointed receiver of the Western Supply Co., Chicago, one of the largest farm implement jobbing firms in the West. The assets are estimated at $200,000 and the liabilities $500,000. This concern handled the product of the Aultman Co.

The controversy as to whether eye bar or wire cables should be used in the construction of the proposed Manhattan bridge, which is to span the East river between Brooklyn and the new East river bridges, has been settled in favor of wire cables, the plans of Bridge Commissioner Best having been approved. Advertisements for bids will be issued at an early date.

Receivers Winchester and Wallace, of the Diamond State Steel Co., have presented to the United States court a statement of the assets and liabilities of the concern. It sets forth that the company has $2,250,000 preferred stock and $2,000,000 common. It has also issued $10,000,000 in four per cent first mortgage bonds, on which is due interest to the amount of $11,387.85. The assets of the company are $511,434.71 and liabilities $385,979.83. There is stock and material on hand to the amount of $248,866.65 and according to the books of the concern the real estate is valued at $4,608,905.99. The statement also sets forth the book accounts of the company. Bills receivable show an amount of $173,396.22; of this sum $112,000 is assigned as collateral for loans. Accounts payable show $64,466.83. An early hearing of the case will be given by the court.

The Paddock-Hawley Iron Co., St. Louis, has called a meeting of creditors. It has been established over 30 years and is capitalized at $600,000. Its inventory of July 1 last showed assets of $1,254,328 and liabilities $581,847. The capital stock was increased in July from $350,000 to $600,000.

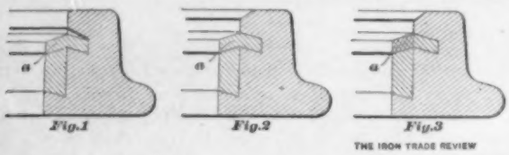
The first board of directors of the re-organized United States Shipbuilding Co. will be elected early in October, and will consist of nine members. It is understood that the board will be selected as soon as possible after the foreclosure sale of the Union Iron Works, of San Francisco.

The Imperial Wheel Co., Jackson, Mich., will move its works in that city to Flint, Mich., where it already has a plant.

SOME GERMAN TOOLS.

BY L. RAMAKERS.

The fastening of tires to car wheels by means of dovetailed rings, as at A in cross sections of Figs. 1 to 3, is considered to be a reliable and very economical method. When the dovetailed section is once wedged in the annular cavity, the wheel center and rim are solidly joined and long service is assured



Wedging tires onto wheels. The engraving is a close reproduction of blueprint but rim of retaining ring should probably be deeper with more allowance in groove.

to the tire. The fitting of the tires is accomplished in a lathe by making the inner part A as indicated in Fig. 3. The main difficulty is in pening the ring in position, an operation which is generally done with a hammer. Ordinary machines are not suitable for pressing out the retaining strip as the pening of the hammer should be delivered obliquely to the surface of the wheel. The firm of Breuer, Schumacher & Co., of Cologne, Germany, has designed and built a press for this purpose which is driven by compressed air. It is shown at work in Fig. 4. The frame carries in addition to the compressed air cylinder with its two pistons, a flywheel and a spindle driven by transmission gearing. A tight and loose pulley are placed on the spindle which bears a crank operated from the upper piston in the compressed air cylinder. The lower piston holds the tool which presses the metal into the slot of the tire. Through a valve located between the two pistons air is introduced or expelled, according to the degree of speed demanded by the character of the work. When the upper piston rises, the valve being closed, the air in the cylinder expands and the exterior pressure gradually raises the lower piston. The upper piston, already at the end of its stroke, is driven back by the crank which continues moving at a uniform speed, descends and strongly compresses the air in the cylinder, stops the upward movement of the ascending lower piston and brings it down sharply on the stock under the tool. Each rotation of the main spindle corresponds to a blow of the press. The force of the stroke is regulated by the opening of the cylinder valve. As shown in Fig. 4, the cylinder is formed in two parts having between them a convenient angle for giving the tool the necessary inclination. The wheel and tire is turned on its axis by a special fixture and the speed is capable of regulation. The arrangement of the crane, which is hand-operated, permits of adjusting the wheel, irrespective of its diameter, in the most favorable position for the work. The mounted axles are suspended by a tackle in order to lighten the load upon the machine frame. This press is capable of dovetailing a tire in place in from three to seven minutes, according to the diameter of the wheel.

The same firm also makes a line of hydraulic presses up to 500 tons. These have auxiliary steam cylinders. The development of this combination type has been the result of an examination of steam hammer peculiarities. The machine, illustrated as Fig. 5, has been designed with a view of uniting the advantages of the steam hammer and the hydraulic press. It comprises an upright frame of cast steel; hollowed out in front. At the summit is the cast steel hydraulic cylinder and below this is the slide for the rectangular hammer head which is forged in one piece with the plunger of the press. The anvil is wedged with shoes at the base of the frame. The steam-driven cylinder is bolted to the upright and the piston rod is attached at its lowest point to the plunger of the hydraulic cylinder. The control is by means of a three-way valve. The hydraulic pressure can thus be employed for heavy work only, the steam being used for very rapid action in light forging and economy is assured by the use of steam to raise the hydraulic plunger from the anvil.

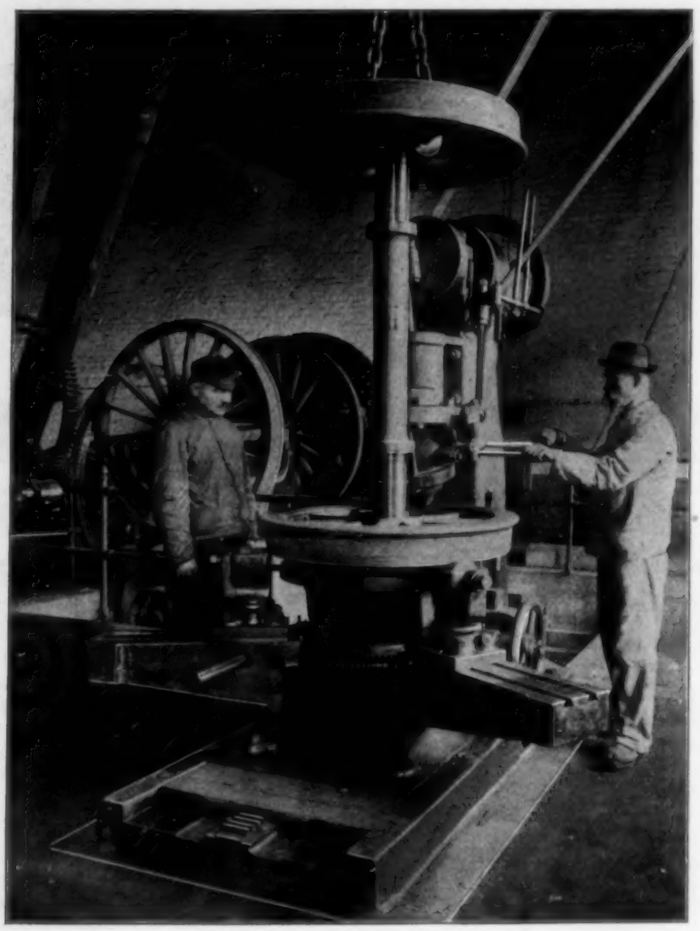


FIG. 4.—AIR-DRIVEN PRESS FOR WEDGING TIRES ON WHEELS.

IRON AND STEEL MAKING IN PENNSYLVANIA.

General Manager Swank, of the American Iron and Steel Association, has been an extensive contributor of iron trade history in the United States, both in his "Iron in All Ages," published a dozen years ago, and in detached articles and monographs. A late contribution is the following excellent review of Pennsylvania's part in the introduction of modern methods of making iron and steel, which appears in the last issue of the *Bulletin:*

Successful experiments in the use of coke in the blast furnace in this country date from 1835, when William Firmstone, a native of England, succeeded in making good forge pig iron for one month at the end of a blast at Mary Ann furnace, in Huntingdon county, Pa., with coke made from Broad Top coal. This pig iron was taken to a forge three miles distant and made into blooms. Coke had previously been used in a small way in forges in Pennsylvania and as a mixture with charcoal in a few blast furnaces. About 1837 F. H. Oliphant made at Fairchance furnace, near Uniontown, in Fayette county, Pa., a quantity of coke pig iron exceeding 20 tons, and probably exceeding 100 tons. He did not, however, long continue the use of coke and resumed the manufacture of iron with charcoal.

The first continuous use of coke in the blast furnace in this country was accomplished at Lonaconing furnace, at Lonaconing, in Western Maryland, in 1838 or 1839. In June, 1839, this furnace, which was built by the George's Creek Co., was making about 70 tons per week of good foundry iron. Other furnaces, particularly in Western Pennsylvania, soon afterwards used coke, but its use as a furnace fuel did not come rapidly into favor and many experiments with this fuel were attended with loss. Anthracite coal was for many years after 1840 the favorite blast furnace fuel next to charcoal. It was not until after 1850 that the use of coke began to exert an appreciable influence upon the manufacture of pig iron. In 1849 there was not one coke furnace in blast in Pennsylvania. In 1856 there were 21 furnaces in Pennsylvania, all in the western part of the State, and three in Maryland which were using coke or were adapted to its use, and their total production in that year was 44,481 gross tons of pig iron. After 1856 the use of coke in the blast furnace increased in Pennsylvania and was extended to other States, but it was not until 1869 that the country made more pig iron with coke than with charcoal, and not until 1875 that it made more than with anthracite. In 1902 more than 19-20 of the country's total production of pig iron was made with coke, either by itself or in combination with anthracite coal, raw bituminous coal, or charcoal. Pennsylvania produces more coke than all the other States combined.

After many unsuccessful experiments with anthracite coal in the blast furnace, and a few moderately successful experiments, the use of this fuel in the manufacture of pig iron was made entirely successful in 1840 by David Thomas, a native of Wales, born in 1794, who, on July 3 of that year blew in the first of the furnaces of the Lehigh Crane Iron Co. at Catasauqua, Lehigh county, Pa., with the new fuel. Water power from the Lehigh river was used in blowing the furnace. On July 4 its first cast of pig iron was made. From the start this furnace produced 50 tons a week of good foundry iron. Other furnaces soon began to use anthracite coal, and in a few years the manufacture of anthracite pig iron became an important branch of the iron industry of Pennsylvania and adjoining States. In 1855 the country made more pig iron with anthracite coal than with charcoal. About 1840 the use of anthracite coal in the puddling and heating furnaces of rolling mills in Eastern Pennsylvania and in some other States became general. It had previously been largely used in the generation of steam. Today comparatively little anthracite coal is used in the blast furnace in this country, and the most of what is used is mixed with coke. In 1902 all the pig iron made with anthracite coal alone amounted to only 19,207 tons.

The use of raw bituminous coal, or uncoked coal, in the blast furnace, which has never been an important factor in the manufacture of pig iron in this country, and what is now virtually abandoned, has been chiefly confined to the Shenango and Mahoning valleys in Pennsylvania and Ohio respectively, in which a particularly hard bituminous coal, known as splint coal, or block coal, is found, and which is not a good coking coal. The use of this coal in its raw state in the blast furnace dates from 1845, when Clay furnace, in Mercer county,

FIG. 5.—HYDRAULIC FORGING PRESS WITH AUXILIARY STEAM CYLINDER.

Pa., was successfully operated with it for some time. In the same year Mahoning furnace, in Mahoning county, O., was built expressly to use this fuel. Other furnaces in the two valleys mentioned were soon built to use raw coal and some charcoal furnaces were altered to use it. In 1856 six furnaces in Pennsylvania and thirteen in Ohio were using it, their total production in that year being 25,073 gross tons. Some progress was afterwards made in the use of the same quality of coal in the Hocking valley in Ohió, and also in Clay county and neighboring counties in Indiana, but since 1880 its use has gradually declined, until today very little pig iron is made with this fuel, and when used it is mixed with coke.

The first shipment of iron ore from the Lake Superior region was made in 1850, and consisted of about ten tons, "which was taken away by Mr. A. L. Crawford, of New Castle, Pa." A part of this ore was reduced to blooms and rolled into bar iron. It was hauled around the falls of Sault Ste. Marie on a strap railroad one and a quarter miles long.

The first use of Lake Superior iron ore in any blast furnace in this country occurred in 1853, at Sharpsville furnace, in Mercer county, Pa., then owned by David and John P. Agnew, and in the same year it was used at Clay furnace, in the same county at both furnaces successfully. After 1856 other furnaces in Pennsylvania and in other states began the use of Lake Superior ore. The first use of Cuban iron ore was in 1884 at furnaces in Eastern Pennsylvania owned by the Bethlehem Iron Co. and the Pennsylvania Steel Co., which companies had undertaken the development of the iron ore deposits of the Gem of the Antilles.

At the Siberian rolling mill of Rogers & Burchfield, at Leechburg, Armstrong county, Pa., natural gas, taken from a well 1,200 ft. deep, was first used as a fuel in the puddling furnace. In the fall of 1874 it was announced that during the preceding six months this gas had furnished all the fuel required for puddling, heating and making steam at these works. Soon after 1874 the firm of Spang, Chalfant & Co., owners of the Etna Iron Works, at Etna, in Allegheny county, Pa., introduced the use of natural gas in all departments of its works. In 1901 there were 45 iron and steel works in Allegheny county which used natural gas in whole or in part and 28 works in other parts of the Western Pennsylvania which used this fuel. In other parts of the country there were 44 works using natural gas in that year. In June, 1904, the whole number of works in the United States which used natural gas was 135, of which 54 were in Allegheny county and 33 were in other parts of Western Pennsylvania.

The manufacture of steel by the old-time method of cementation had an existence in Pennsylvania, as in some other States, before the Revolution, but it never attained a position of much prominence, while the manufacture of crucible steel, although often experimented with, and sometimes very successfully, made but slow progress down to about 1860. Up to this time the country's main reliance for steel was upon English manufacturers, who were favored in our markets by low duties. The manufacture in this country of crucible steel of the best quality may be said to have been established on a firm basis after Hussey, Wells & Co. and Park, Brother & Co., of Pittsburg, and Gregory & Co., of Jersey City, in the years 1860, 1862 and 1863 respectively, succeeded in making it of uniform quality as a regular product. The event was of great importance, as it marked the establishment in this country of a new and greatly needed industry. Dr. Curtis G. Hussey, of Pittsburg, is entitled to the honor of having established this industry in our country on a solid foundation, the firm of which he was the head having successfully made crucible steel of the best quality as a regular product in 1860 for the first time in our history. Of the country's total production of crucible steel in 1902 Pennsylvania made over three-fourths, and nearly all of this large proportion was made in Allegheny county.

The manufacture of pneumatic or Bessemer steel was commenced in an experimental way in this country at Wyandotte, Mich., in 1864, and at Troy, N. Y., in 1865. We waive all discussion of the conflicting claims of William Kelly, of Eddyville, Ky., and Sir Henry Bessemer, of England, to priority of invention of the Bessemer process, but it is important to add that the steel made at Wyandotte was made by a company which was largely composed of Pennsylvanians. In June, 1867, the Pennsylvania Steel Co., at its works at Steelton, near Harrisburg, made the first Bessemer steel that was made in Pennsylvania. In 1867 this country produced 2,679 tons of Bessemer steel and 2,277 tons of Bessemer steel rails. The first steel rails ever rolled in the United States upon order, in the way of regular businss, were rolld by the Cambria Iron Co., at Johnstown, Pa., in August, 1867, from ingots made at the works of the Pennsylvania Steel Co. From this time on the manufacture of Bessemer steel in this country steadily advanced, although slowly at first, until in 1902 the country produced 9,138,363 tons of Bessemer steel and 2,935,392 tons of Bessemer steel rails. From the first Pennsylvania has been by far the most active of all the States in the development of the Bessemer steel industry. Of the country's total production of Bessemer steel ingots and castings in 1902 Pennsylvania made over 46 percent, and of the total production of Bessemer steel rails in the same year Pennsylvania's share was 38.7 percent.

The manufacture of steel by the Siemens-Martin, or open-hearth process, was introduced into this country in 1868 by Cooper, Hewitt & Co., at the works of the New Jersey Steel & Iron Co., at Trenton, N. J. For many years this method of making steel made slow progress in the United States. In August, 1875, there were thirteen establishments in this country which were then making open-hearth steel or were prepared to make it, and five of these were located in Pennsylvania, of which three were in Pittsburg. The total production of open-hearth steel in 1875 was, however, only 8,080 tons, and ten years afterwards it was only 133,376 tons, but in 1895 it was 1,137,182 tons and in 1902 it was 5,687,729 tons. Of the total production in 1902 Pennsylvania's share was 4,375,364 tons, or nearly 77 percent. The production of Allegheny county in that year was 2,503,245 tons, or 44 percent of the whole country's production.

More than four times as much open-hearth steel is now made in this country by the basic process as by the original acid process. In a census report for 1890 we find the following statement concerning the first basic open-hearth steel made in the United States: "The first basic steel made in the United States was produced experimentally at Steelton, Pa., by the Pennsylvania Steel Co., on May 24, 1884, in a Bessemer converter. The beginning of the manufacture of basic steel in this country as a commercial product, however, dates from 1888, on March 28 of which year the first basic open-hearth steel was produced at the Homestead Steel Works of Carnegie, Phipps & Co., Ltd., at Homestead, near Pittsburg, Pa. Since that date the manufacture of basic open-hearth steel has been continued at these works." It is proper to add, however, that for about three months in 1886 basic steel was successfully made in commercial quantities in the open hearth by the Otis Iron & Steel Co., at Cleveland, O.

Among recent orders for railroad equipment are the following: Swift Refrigerator Transportation Co., 200 refrigerator cars from the American Car & Foundry Co.; three observation and smoking cars for the Chicago, Northwestern from the Pullman Co.; one hundred box car bodies for the same company; forty gondola cars for the New York, Ontario & Western railway, to be built at its Norwich shops. The American Locomotive Co. has received an order from the Canadian Pacific railway for twenty locomotives. The Erie railroad is reported to be figuring on placing an order for 50 to 100 locomotives. The Central Railroad Co., of New Jersey, is having ten locomotives built. The C., H. & D. has just let the contracts for 2,500 new box cars, 1,500 coal cars, 70 passenger coaches and 50 freight cabooses, to be built by the American Car & Foundry Co. Specifications are now being prepared for 40 new engines and fine passenger equipment.

It is announced by the International Harvester Co. that the force employed at the Champion division at Springfield, O., is to be increased until the number of men employed reaches 2,000. The closing of the McCormick, Deering and Plano divisions on account of labor troubles is responsible for the decision to increase the output at the Springfield plant.

SOME SHOP EXPERIENCE.

The use of structural steel in building up frames for large generators forms a distinctive feature of European design. The advantage of this construction is in the relatively small amount of material required for the frame. The manufacturing conditions, the relative cost of labor and material, and other conditions which prevail in Europe render the saving of raw material a very important item. The different conditions existing in this country, however, makes such a saving of relatively small importance. For this reason structural steel frames have never been employed in American machines. This frame has been carefully considered in the design of several large American alternators, but it was not adopted. In the case of a 5,000- k. w. machine it was found that the usual type of cast iron box frame formed approximately 40 percent of the total weight of the machine and probably 10 percent of the total cost. Assuming a structural steel frame to weigh 25 percent of the weight of the cast iron frame, the use of the structural frame represents a saving, considering material only, of 7 percent of the total cost of the machine; but this saving is largely offset by the greater labor expense required by the building and erection of the structural frame. Structural frames require considerably more work on the part of the erecting department, and their success is largely dependent upon the thoroughness of the erection work. This throws a large amount of heavy work upon a department not always well equipped for handling it, making the erection slow and expensive. The erection is especially difficult with machines having frames of the strut construction in which the amount of electrically inactive material is reduced to a minimum. Difficulty has also been experienced in shipping strut frames, it having been found necessary to completely box them, when shipped in sections, in order to give them the necessary support.

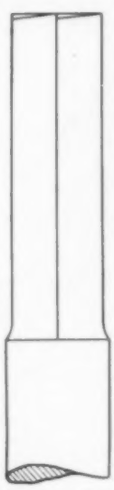


FIG. 1.—SHAPE OF CUTTING TOOL.

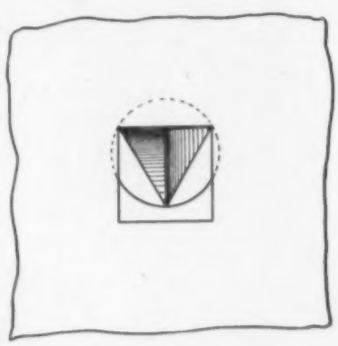


FIG. 2.—RELATIVE POSITIONS OF TOOL AND JIG.

The cutting edges are AD, DB and DC.

The usual practice of using a punch or drill and slotter to produce a square hole in a soft metal piece may be obviated, if the desired hole be small, and if the sides need not be perfectly true. The tool employed to drill such a hole is triangular in cross section and has a round straight shank, clamped in the drill chuck of a high-speed lathe. The free end of the tool carries the cutting edges, which are three in number and ground as in Fig. 1. The three edges of the triangular part extending from the shank to the end are not ground and take no part in the formation of the hole, so that the finishing as well as cutting is done by the end face edges. A small hard steel jig is used with this tool. A convenient size is 2 x 1½ x ¼-in. and, if a ¼-in. hole is to be drilled, the hole in the plate should be ¼ x ¼ x ¼-in. A square of the desired size is laid out in the proper position on the piece to be drilled and the steel jig clamped to the piece by means of a small screw clamp in such a way that the outline of the hole in the jig coincides with that laid out on the piece. The lathe is operated the same as in drilling a round hole. The piece is held against the end of the revolving tool by hand, and the edges on the side of the tool striking against the smooth sides of the hole in the jig cause the piece to vibrate rapidly through a small amplitude. The sharp cutting corners which shape the outline of the hole leave a small amount of metal in the corners and middle of each side. A hexagonal hole may be drilled in the same manner by using a templet with a hexagonal hole. The result with either form will not be exact, but approximate enough to fill many requirements. The holes are easily and quickly drilled and may be made as deep as desired within certain limits.—[The Electric Club Journal.

OPEN-HEARTH STEEL IN UNITED STATES IN 1903.

The American Iron and Steel Association has received virtually complete statistics of the production of open-hearth Steel in the United States in 1903, and these appear in the current issue of the *Bulletin*. The production was larger than in 1902 or any preceding year. The total production of open-hearth steel ingots and castings in the United States in 1903 was 5,837,789 gross tons, against 5,687,729 tons in 1902, an increase of 150,060 tons, or 2.6 percent. As compared with 1898, six years ago, when the production of open-hearth steel amounted to 2,230,292 tons, there was an increase in 1903 of 3,607,497 tons, or over 161 percent. The following table gives the production of open-hearth ingots and castings, by States, since 1900:

States.	1900. Gross tons.	1901. Gross tons.	1902. Gross tons.	1903. Gross tons.
New England..	74,522	170,876	179,923	169,209
N. Y. and N. J.	67,361	82,985	92,763	104,598
Pennsylvania	2,699,502	3,594,763	4,375,364	4,442,358
Ohio	130,191	184,943	278,854	369,249
Illinois	285,551	398,522	435,461	422,919
Other States..	141,008	224,220	325,364	329,456
Total	3,398,135	4,656,309	5,687,729	5,837,789

The open-hearth steel made in 1903 was produced by 111 works in 17 States—Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, Tennessee, Alabama, Ohio, Indiana, Illinois, Wisconsin, Missouri, Colorado and California. Ninety-eight works in 16 States made open-hearth steel in 1902. The States which have open-hearth furnaces, but which did not produce open-hearth steel in 1903, were West Virginia and Kentucky.

In 1902 4,496,533 tons of open-hearth steel were made by the basic process and 1,191,196 tons were made by the acid process, while in 1903 the production by the basic process amounted to 4,741,913 tons and by the acid process to 1,095,876 tons. In the following table the production by States of both acid and basic open-hearth steel ingots and castings in 1903 is given:

States—Gross tons	Basic open-hearth steel	Acid open-hearth steel	Total Gross tons
New England	105,778	63,431	169,209
N. Y. and N. J.	71,537	33,061	104,598
Pennsylvania	3,557,493	884,865	4,442,358
Ohio	308,575	60,674	369,249
Illinois	390,513	32,406	422,919
Other States	308,017	21,439	329,456
Total	4,741,913	1,095,876	5,837,789

There was a decrease in the production of acid steel in 1903 as compared with 1902 of 95,320 tons, or a little over 8 percent, but an increase in the production of basic steel of 245,380 tons, or almost 5.5 percent.

The total production of open-hearth steel castings in 1903, included above, amounted to 384,809 gross tons, of which 134,879 tons were made by the basic process and 249,930 tons were made by the acid process. In 1902 the production of open-hearth steel castings amounted to 367,879 tons, of which 112,404 tons were made by the basic process and 255,475 tons by the acid process. The following table gives the production of open-hearth steel castings by the acid and basic processes in 1903 by States:

States—Gross tons	Basic castings	Acid castings	Total Gross tons
New Eng., N. Y. and N. J...	5,311	30,783	36,094
Pennsylvania	14,483	150,749	165,232
Ohio, Ill., and other States..	115,085	68,398	183,483
Total	134,879	249,930	384,809

In addition to the States enumerated in the table Massachusetts, Connecticut, Tennessee, Alabama, Indiana, Wisconsin, Missouri and California made open-hearth steel castings in 1903.

AN AUTOMATIC MOLDING MACHINE.

Many attempts have been made to produce an automatic molding machine. The one illustrated in Fig. 1 is the result of a good many years of careful experiment and has now been brought to commercial success. Only one or two of the usual mold making operations are actually performed by a machine, but in this instance the sand is riddled back of the machine and elevated by a bucket elevator to a suitable hopper above the work. The pattern plate is let into a table or platen in the front of the machine and can be changed very quickly by simply removing a few screws, the plate being located by dowel pins. Ordinarily the patterns are placed in reverse positions on opposite sides of the runner so that the cope and the drag are alike and ready for the setting of the sprue pins in the former.

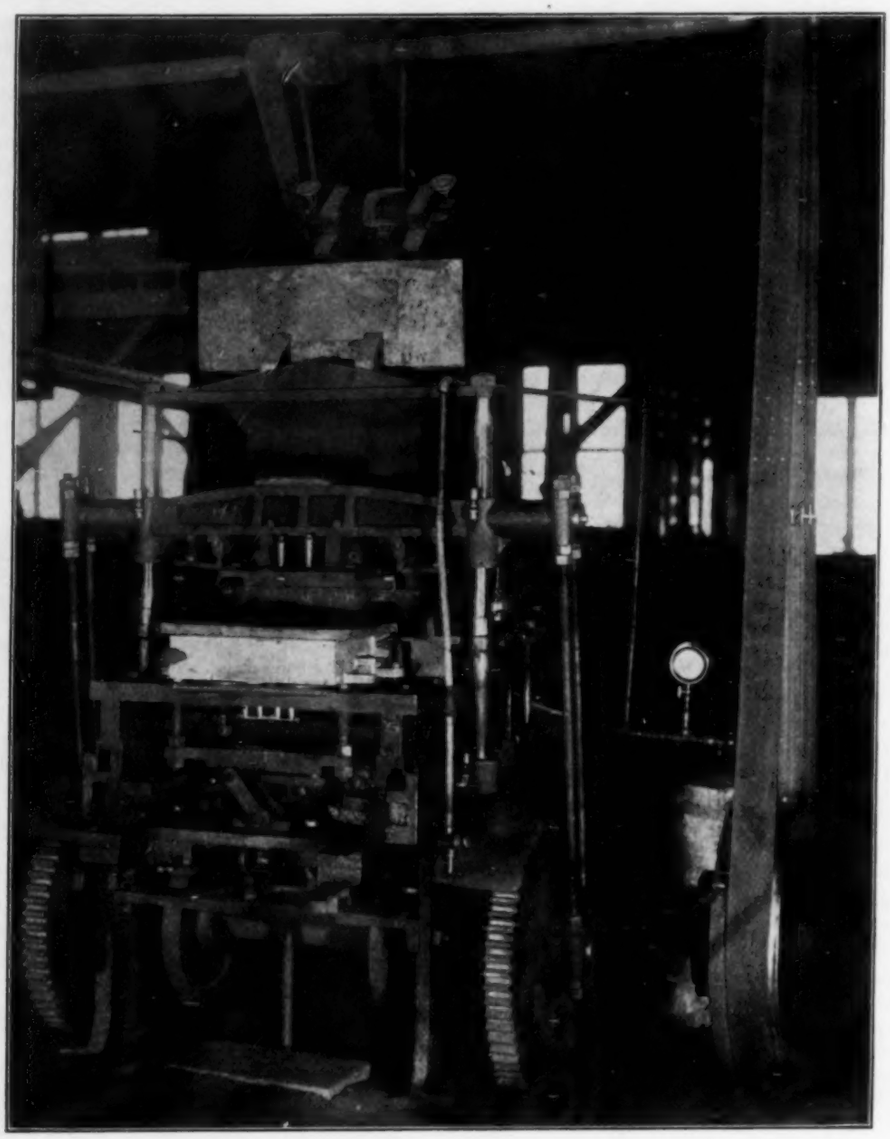


FIG. 1.—THE BERKSHIRE MOLDING MACHINE.

When operating the machine the flask and bottom board are placed in position and the lever for starting the machine is thrown. The machine automatically carries the flask to the rear, where it is filled with sand, it then travels forward and in its course, is met by the bottom board, supported by the ram, which is forced down, ramming the sand. The vibrator is immediately thrown into action and at the same time the lifting pins raise the flask away from the pattern. As the flask goes back to receive its charge of sand the bottom board is supported by hooks, but as the ram comes down these hooks are drawn back and the board remains upon the mold. All that the operator has now to do is to lift the flask off and set it to one side, blow the sand from the table by means of the air hose, and all is ready for receiving the remaining half of the flask and making the other half of the mold. The operator economizes time by placing the second half of the flask upon the table and starting the machine before he goes to the floor with the half of the mold that has been completed. By the time he has placed the complete half of the mold on the floor, the second half has been finished by the machine, and is already to be lifted off and carried away.

When using snap flasks and making light molds the mold can be assembled on a bench by the side of the machine and only one trip to the floor made. A photograph of such a flask with light damper work is seen in Fig. 2. In this case the molder can have two sets of flasks and arrange matters so that the machine is ramming the drag for the second mold while he is carrying the first to the floor.

When making the cope the machine is so designed that it cuts the sprue. In fact, the machine does all the work. The operator simply places the flask and board in position, throws the lever, and in five seconds removes the finished half of the mold.

The pressure with which the ram presses the sand can be quickly adjusted, and as the flasks are filled automatically, all flasks are sure to be rammed alike. It is also possible to adjust the boards in such a way that the drag will be rammed harder than the cope.

One interesting point about the machine is that the pattern plates are heated by gas jets from beneath, so that the molds

draw readily without the use of any parting material whatever. By the use of the proper grade of molding sand, very fine work can be made in this way without any facing, and the fact that no parting sand is introduced will greatly increase the life of the molding sand. It is also possible to fit up the machine with pattern plates quite cheaply, though, as in many similar cases, skill is required for this work.

The mistake founders often make in putting in a molding machine is that they set the machine up, get a few pattern plates, but never give it a fair show. It is necessary to supply brains for this part of the foundry after the machine has been purchased, and if the original cash investment is supplemented by an investment in a good man to look after the molding machine work, there is no reason why a large amount of work now done in an indifferent manner by hand cannot be done much cheaper and better on the machine.

The machine shown in Fig. 2 is made by the Berkshire Mfg. Co., of Cleveland.

A Process of Hardening Iron and Steel.

According to the *Mechanical Engineer* the Feuerfeste Industrie Gesellschaft of Düsseldorf has introduced a patented process of hardening iron and soft steel. The carbon requisite for the tempering is obtained by means of carbides and certain fluxes. For instance, a mixture of silicium carbide (SiC) and sodium sulphate ($Na_2 SO_4$) is applied to cold iron or steel and then heated to redness with it, or the red hot metal is covered with the mixture. The reaction is so rapid that even thin objects can be hardened on one side. Within a short time a plate 2 mm. or 3 mm. thick becomes hard enough on one side to resist the best tempered steel tool, while the other remains wholly soft. Interesting experiments were

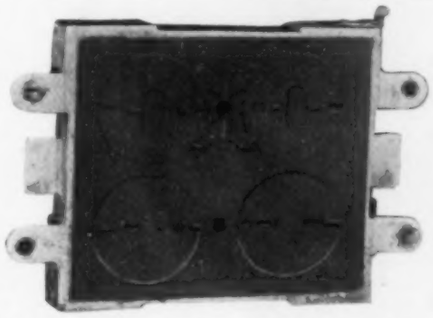


FIG. 2 — PRODUCT OF THE AUTOMATIC MOLDING MACHINE.

made with armor-plates. A plate of ordinary Martin steel (70 kilos. strength) was smeared 6 mm. thick with the mixture, then a second plate was placed upon the latter, and the "sandwich' maintained at red heat for a couple of hours, after which it was cooled in oil. At a distance of 20 meters the hardened sides of these plates received a dozen bullets from a German rifle, model '98, without showing signs of a rip. A 5 mm. plate of common Siemens-Martin steel, treated in the same way, was tested at a range of 100 meters. The impression of the bullet was very faint, nor could any cracks be detected.

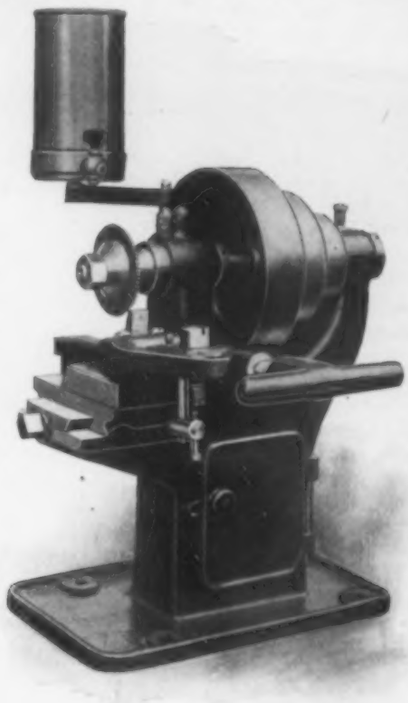
Contracts for two modern freight steamers, costing upward of $800,000, have been closed with the American Shipbuilding Co., making five vessels for which the company has received orders in a few weeks. The last two orders are for vessels that will rank next to the Augustus B. Wolvin. One was ordered by the Acme Steamship Co., of which A. B. Wolvin is president. She will be 540 ft. over all, 520-ft. keel, 56-ft. beam, and 31 ft. deep. She will carry 10,000 tons and will cost $420,000. The second order was for a steamer which will have a carrying capacity of about 10,000 tons, and was placed by Samuel Mather, of Pickands, Mather & Co., of Cleveland. The steamer will be 545 ft. over all, 525-ft. keel, 55-ft. beam, and 31 ft. deep. About 6,000 tons of material will be used in the construction of the two boats.

Work on the addition to the plant of the Ulster Iron Works, Dover, N. J., is progressing steadily. The company has resumed operations after a two months' shut down.

A NEW BENCH SCREW SLOTTER.

In the design and construction of this machine the designer has aimed to meet the requirements of the shop having numerous small quantities of special screws to slot and the capacity of the tool covers a range of screw sizes from the smallest to ½-in. filister head; the smaller ones can be slotted at the rate of 500 per hour. This slotter is built in substantial style; the spindle runs in two tapered self-oiling bronze bearings with adjustments on each to compensate for wear, thus providing for a perfectly stiff spindle at all times. The carrier slide has a transverse adjustment of ⅞ in. and it is thereby possible to place two cutters on the spindles for the purpose of milling two flats on a piece at once. The cone pulley has three steps for a 1-in. belt and gives ample range of speeds for both brass and iron screws.

The jaws for holding the work being made of 1-in. round cold drawn steel are simple and inexpensive to make and jaws for such irregular shapes as may be included in a ½ x ¾-in. space can be used in the machine to advantage. The fulcrum pin on which the carrier holding the jaws swings has large adjustable bearings and the handle on jaw clamping screw can be positioned so that when jaws are closed this handle will be parallel with the spindle and in the most favorable position for the operator. A stop screw is provided to regulate the depth of slots in screws to a nicety. The operations of gripping, slotting and releasing the screws are all done with the right hand. The threaded blank is inserted between the carrier jaw with the thumb and finger of the left hand and is clamped with the screw shown at the top of the hinged carrier in front of the saw. After the slotting operation the operator swings the carrier away from the saw, and at the same time releases the work by a slight turn of the clamping screw. The advantages of the tool are the production of work equal to a standard milling machine, greater rapidity of production, advantage of being always set up and the comparatively small investment. The countershaft can be furnished for either bench, wall or overhead use.



SCREW SLOTTING MACHINE FOR BENCH USE.

The machine is manufactured by the Grant Mfg. & Machine Co., of Bridgeport, Conn.

The directors of the Fort Worth Iron & Steel Mfg. Co., Fort Worth, Tex., recently incorporated, have elected the following officers: President, W. K. Frogg, Alliance, O.; vice president, F. G. McPeak; secretary, J. T. Anderson; treasurer, W. H. Eddleman, all of Fort Worth. Contracts for some of the buildings will be awarded at once.

MOTOR-DRIVEN MACHINE TOOLS.

A very compact arrangement is shown in Fig. 1 and illustrates the new pattern No. 6 Bement horizontal slab milling machine with motor drive. The principal dimensions of this machine are as follows: Distance between uprights, 37½ in.; maximum height of spindle above table, 37½ in., and maximum diameter of cutters, 16 in. All the gears are enclosed, and in order to prevent a multiplicity of gear guards a box, shown in the foreground, is employed for covering the feed and driving gears. The cross rail is raised and lowered by an independent motor and is counterweighted.

The table has variable power feeds in both directions, as well as quick power traverse and rapid and fine hand adjustment. An adjustable stop is provided for the table feeds. The bearing for the outer end of the mandrel may be traversed entirely free of the arbor and thus allow easy insertion of different mandrels. The feeds are positively driven by gearing.

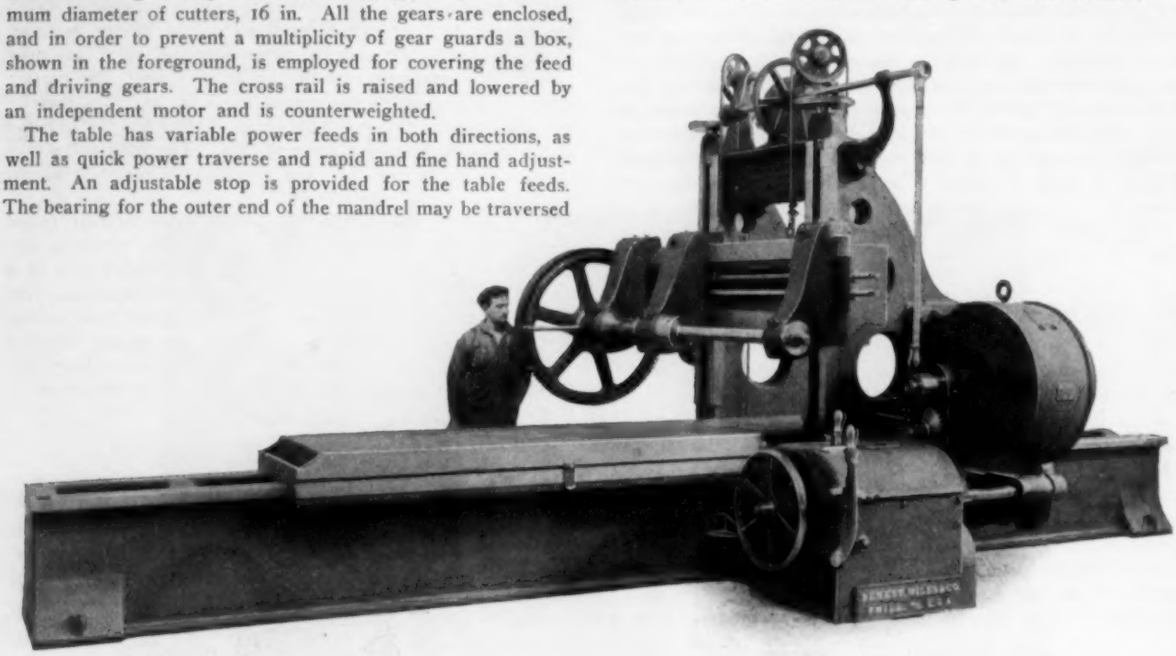


FIG. 1.—HORIZONTAL MILLER WITH MOTOR DRIVE.

Another interesting solution of the machine tool drive problem is presented in Fig. 2. It is quite an undertaking to attach a motor to a lathe headstock, have a compact design and at the same time secure the desired number of speed changes as well. The engraving depicts the combination of a 12-h. p. variable speed Westinghouse motor directly attached to the headstock of a standard 63-in. lathe.

The motor in Fig. 2 has a range of speed from 280 to 1,120 revolutions per minute and is operated on a three-wire system. The leading dimensions of the lathe are as follows: The swing over bed is 66 in. and the swing over the carriage is 53 in. The 18-ft. bed permits of turning 7 ft. 6 in. between the centers. The carriage is provided with a swing rest in addition to the regular rest.

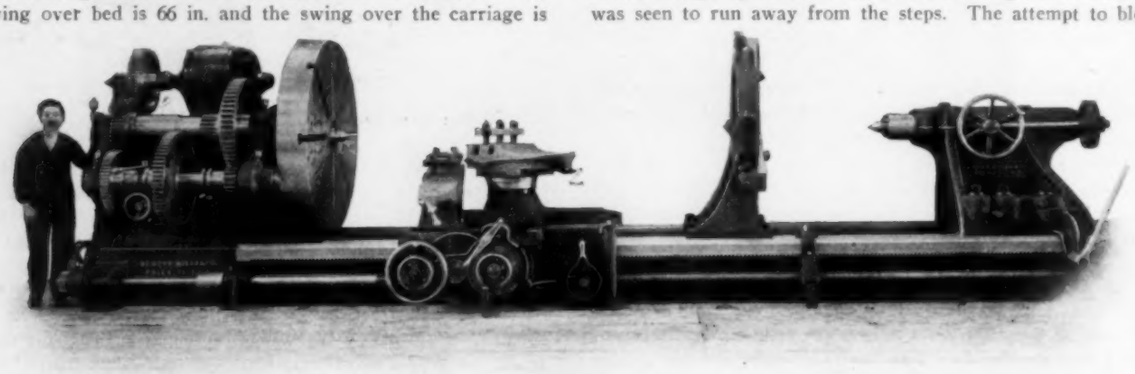


FIG. 2.—A 63-IN. MOTOR-DRIVEN LATHE.

Both of these machine tools, the horizontal slab milling machine and the 63-in. lathe, were built by the Bement-Miles Works, at Philadelphia, of the Niles-Bement-Pond Co., of New York.

At the annual meeting of the stockholders of the National Steel & Wire Co., New Haven, Conn., the old board of directors and officers were re-elected. Of the $10,000,000 authorized stock of the company, about $5,000,000 has been issued. The preferred stock pays 7 percent dividends, which are cumulative. There is no bonded indebtedness. The company is a holding concern, organized by the consolidation of the following companies: The National Wire Corporation, of New Haven; the National Steel Foundry Co., New Haven; the Safety Insulated Wire & Cable Co., Bayonne, N. J.; the Dekalb Fence Co., Dekalb; the Kansas Steel & Wire Works, Kansas City, Mo.; and the Pacific Steel & Wire Co., Oakland, Cal. The business of the company for the past year was fully up to the standard of concerns similarly engaged throughout the country.

A neighbor passing the residence of J. C. Maben, president of the Sloss-Sheffield Steel & Iron Co., at Birmingham, Ala., last week saw fire sputtering on the front steps, and found a bottle with a burning fuse attached. Examination of the bottle after the fuse was extinguished showed that it contained enough dynamite to wreck the building. A white man was seen to run away from the steps. The attempt to blow up the residence is generally attributed to the strikers in the mines owned by the Sloss-Sheffield company.

The plant of the American Clay-Working Machinery Co., of Bucyrus, O., with another plant at Willoughby, O., will be sold by the receiver Oct. 20. The company is the largest in the world devoted to the manufacture of brick and tile machinery. A plan has been perfected to sell the plants to the creditors, and it is understood that R. C. Penfield, who formerly operated them, will be manager.

DEATH OF ARCHER BROWN.

Archer Brown, of the firm of Rogers, Brown & Co., died suddenly at his home in East Orange, N. J., Friday, Sept. 23. His death was very unexpected, as he had been in his usual health and at business throughout the week until Friday morning. He felt somewhat indisposed, being troubled apparently with indigestion and concluded to remain at home. In the afternoon as late as 2:30 he was in telephonic communication with his office and did not appear to be at all seriously ill. But as the pain did not disappear a physician was called in. Remedies brought relief, but toward evening Mr. Brown was seized with a paroxysm of pain about the heart and soon after passed away. Mrs. Brown and the younger daughter were at home. Two sons were summoned, one from New York and the other from Princeton. A daughter was called home from Wellesley. The funeral was held on Monday afternoon at the residence.

Mr. Brown was born in Otsego county, N. Y., March 7, 1851. When a child he went with his mother to Flint, Mich., and entered the University of Michigan in 1868, graduating four years later. Soon after graduation he became a reporter on the Cincinnati *Gazette*. His career was marked by a steady advancement, and he was managing editor of the *Gazette* from 1875 to 1880. About that time occurred the memorable temperance crusade inaugurated by the women of Ohio and Mr. Brown wrote a history of it. The book became so popular that from the proceeds of its sale he was enabled to take a European trip. In 1880 he became connected with the pig iron concern of Rogers, Trevett & Co., Cincinnati. When Mr. Trevett died in 1881, Mr. Brown became a member of the company and the name was changed to Rogers, Brown & Co. The firm established branches in Chicago, St. Louis and elsewhere, and in 1890, in order to extend the scope of its operations, it was reorganized. Mr. Rogers was put in charge of the Tonawanda Iron & Steel Co. and in general of the Northern furnace and lake ore interests of the firm. In 1895 Mr. Brown went to New York to look after the Eastern business of the concern, Mr. D. B. Meacham then assuming charge of the offices at Cincinnati. He was connected officially with the following companies:

ARCHER BROWN.

Vice president Tonawanda Iron & Steel Co., Tonawanda, N. Y.; chairman of the executive committee of the Empire Steel & Iron Co., Catasauqua, Pa., and of the Allegheny Ore & Iron Co., of Virginia; director of the Cleveland Furnace Co., Cleveland, O.; Iroquois Iron Co., of Chicago; Alabama & Georgia Iron Co., Empire Trust Co., Phenix National bank and Plano Mfg. Co. He was president of the Citizens' Union, of East Orange, N. J., vice president of the local Y. M. C. A. and member of the international committee of the Y. M. C. A., trustee of Calvary Methodist Episcopal church, of East Orange, superintendent of its Sunday school, and trustee of Drew Theological Seminary.

Mr. Brown was deeply interested in young men, and for that reason was one of the prominent and energetic workers connected with the Young Men's Christian Association. A few years ago he published a little book entitled "Top or Bottom—Which?" It was intended for young men and abounded in sensible, practical advice from the standpoint of a business man who from personal experience knew the value of the homely virtues in the attainment of material success and as a means to good health and rational pleasure. More than 100,000 copies of this book have been circulated. The dedication is in these words: "To my sons, Archer and Lowell, first to me of all American young manhood." Mr. Brown was a fluent speaker and was frequently called upon to deliver public addresses before business organizations and other societies. He has been a frequent contributor to magazines and newspapers on matters relating to the iron and steel trade, and probably no man in the United States was more widely quoted on this subject.

His career has been a conspicuous one in the iron trade, particularly that portion of the trade which touches the important foundry interests of the country. Mr. Brown took an active part in the campaign for the creation of a foreign market for Southern pig iron in the years following the depression of 1893, and studied the various ramifications of the export problem with the same thoroughness he brought to all the economic questions bearing upon the manufacture and marketing of pig iron. His untimely taking off is a loss that will be felt widely. With his employes his relations were on a footing of friendliness rarely found and the warm friends he made among his business acquaintances were of uncommon number.

The furnace of the Rockdale Iron Co., at Rockdale, Tenn., is being put into shape to make domestic ferro-phosphorus. J. J. Gregg, the owner of this furnace, was the originator of the idea of manufacturing ferro-phosphorus. The furnace will be put in operation on this new product about Oct. 1. Hickman, Williams & Co. are the selling agents.

The directors of the International Steam Pump Co. have reduced the dividend rate on the common stock from 1 to 1½ percent. It had been expected in some quarters that the dividend on this issue would be passed. This belief was encouraged on account of the known falling off in the company's earnings. The explanation given by the management of the reduction in the common dividend was that it was considered for the best interests of all concerned that the quarterly declaration should be reduced until the extensive new plant at Harrison, N. J., shall have been completed. It is expected that this plant will be in full operation near the close of the year. It is claimed that the new plant will enable the company to effect a number of important economies, which have not been possible at the Brooklyn plant on account of the crowded condition and lack of capacity at the latter. The usual quarterly dividend of 1½ percent was declared on the preferred stock.

The chief engineer of the Yerkes Tube railways in London, explaining the reason for placing an order for 100 steel cars, worth $500,000, with an American car company instead of with an English firm, said it was impossible to find a single firm in England which could fill the order.

A bill has been introduced by Sir William Lyne in the Australian house of representatives to provide bounties for the encouragement of iron and steel manufacture in Australia. It provides a bounty of $2.48 per ton on iron and 10 percent on value of manufactures of iron and steel.

THE IRON TRADE REVIEW

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THE MARCH OF OPEN-HEARTH STEEL.

Despite the fact that Bessemer steel production in 1903 fell 6.1 percent below that in 1902, the record of open-hearth steel production, as presented elsewhere in this issue, shows an increase of 2.6 percent, and this also notwithstanding the handicap of a slight decrease in acid open-hearth production. Basic open-hearth steel manufacture is really more separate from the acid open-hearth industry than it is from the Bessemer steel industry, so far as concerns the uses to which the product is put, while it is almost equally separated from either as regards the character of its raw materials. Before the basic industry assumed important proportions, however, the acid process had shown a rapid increase.

The remarkable growth of the open-hearth steel industry as a whole can be strikingly shown by noting the short periods which have been required for the production to double. This is brought out in the following table, which, starting with the production in 1903, presents successive bisections and then selects the year most nearly conforming to the bisected tonnage, the period between such years being noted:

Open-Hearth Steel Ingots and Castings, Gross Tons:

1903 Production and Bisections.	Closely Conforming Years with Production.		Interval in Years.
5,837,789	5,837,789	1903	
			4
2,918,894	2,947,316	1899	
			2
1,459,447	1,608,671	1897	
			4
729,723	737,890	1893	
			4
364,861	374,543	1889	
			3
182,430	218,973	1886	
			6
91,215	100,851	1880	
			1
45,607	50,259	1879	
			2
22,803	22,349	1877	
			2
11,401	8,080	1875	
			1
5,700	6,250	1874	
			2
2,850	2,679	1872	
			2
1,425	1,339	1870	
			1
712	893	1869	

It happens that in selecting the nearest year it has been necessary, since 1879, to take a year in which the production exceeded the bisection. The comparison has been followed down to the earliest times, when the production according to present standards appears insignificant, merely as some rejoinder to the oft repeated pronunciamento that we cannot expect nearly the same relative expansion in the future that we have had in the past. As a matter of fact we can have no argument at all that we have stopped growing, until we do stop. The table, then, shows that from the time the production ran into six figures the average interval for doubling the production has been 3.4 years, while prior to that time 2.125 years were required. The difference is certainly not very great. Furthermore, we quadrupled in eight years from 1889 to 1897, and quadrupled again in only six years, from 1897 to 1903. It is true that 1896 fell only a little more short of quadrupling 1889 than 1897 had to spare, but on the other hand 1902 came almost as near the mark as 1903, so that we could say that, substantially, we quadrupled in seven years from 1889 to 1896, and quadrupled again in six years, from 1896 to 1902.

Basic open-hearth steel production alone more than doubled from 1897 to 1900, while the production of even 1902 was more than a quadruple of 1897—only five years. Bessemer steel production has had a vastly slower growth. It quadrupled in five years from 1872 to 1877, then in nine years from 1877 to 1886, while the last quadrupling required sixteen years.

IRON TRADE PROSPERITY AND PRICES.

It is astonishing that the iron trade must depend completely upon operations at the highest tension for what passes current for "prosperity." A moderate degree of activity seems to spell stagnation and a great decline in production would apparently be considered extinction. The trade is not in satisfactory condition, at least according to recently formed standards, unless it is breaking production records and prices are advancing. In no other trade or country can a parallel be found for the use of such a yardstick.

By common consent the year 1904 can be set down as a very bad one in the American iron trade, yet production of pig iron for the year will certainly be between 15 and 16 million tons, and will very probably exceed 15½ million tons. Fully 10½ million tons was produced in the first eight months of the year. Hence we can only fall short of our record calendar year by between 11 and 17 percent. Our best twelve months' production was from Oct. 1, 1902, to Sept. 30, 1903, 19,050,000 tons, and even from this we can fall short but between 16 and 21 percent.

Nevertheless these apparently small, almost insignificant, declines mean stagnation, falling prices and almost distress. This is fully in accord with the principles and precedents of the iron trade. The disastrous year of 1894 saw a pig iron production only 23 percent less than the previous high record, made in 1890, and which exceeded the production of 1887 and 1888; only six and seven years previous, and these were years of extreme prosperity.

Furthermore, the production of pig iron in the present year is destined to exceed slightly that of 1901, and to exceed by probably 15 percent the production of our famous boom year 1899.

The "prince or pauper" view of the American iron

trade has become so popularized in the past few years that it is liable to misconstruction. It is neither a new view, nor one based upon observations limited as to time. Twenty years ago Mr. James M. Swank voiced the same sentiment when he said that the trade had either a fever or a severe chill. Where the possibility of misconstruction lies is in making the principle applicable to production. This is emphatically not the case. It applies to profits. It is therefore rather with the course of prices than the course of production that the trade should concern itself at the present time. One of the missions of the United States Steel Corporation was to end the sway of the prince and pauper principle. With consumption it had not the same concern, the work cut out for it being to maintain stability of prices. This it did when it was a case of endeavoring to restrain advances, and this work, whether really necessary or not, it did quite well.

This year its self-imposed task has been to prevent decline. To sustain the market for iron ore and iron products generally it made pig iron purchases in the spring, with ultimate reaction and bad results to the trade. As to prices of finished products, it has practiced the extreme policies of resisting price reductions, and of making them when there seemed little or no occasion. Along with other rail manufacturers it has insisted on maintaining rails at $28 in the face of a general decline, when old rails have dropped to $12 and light rails have sold as low as $18, although a more finished and expensive product. On the other hand, some of its cuts have been complete surprises to the trade. In the fall of 1902 it held tin plate at $4 when the market was being generally shaded by independents. Last month it cut tin plates when there was very little if any shading by independents. Yet it has itself shaded its official price on tin plate, and has probably sold more tin plate at cut prices in the past twelve months than have the independents. Its last wire cut was apparently for retaliatory or disciplinary purposes and not in the course of ordinary commercial competition. In other lines, also, it has made cuts, ostensibly in reply to independent cutting, when in fact the low prices complained of were made by smaller producers and not by the principal independent interests.

The events of the past year and a half have given no encouragement to those who expected the Steel Corporation to maintain the various finished material markets at levels insuring a comfortable existence to the outside manufacturer. The corporation, while in the main a conservative in prices, has readily assumed the role of an agile opportunist. It has taken account of sporadic cutting by small interests in a way that suggests a willingness to become the policeman of the trade, on occasion, and in its pool relations with larger independent interests it has not allowed official prices to stand in the way of getting its full share of business.

The outcome of these experiences in a falling market may be a better appreciation by all producers of the necessity of some effort to prevent indiscriminate cutting. The advent of the United States Steel Corporation, it has been demonstrated, has not eliminated the prince and pauper phases of the trade. Yet the presence of such a power, in the light of the varying ways in which it has lately been exerted, may in the end secure a steadier market than was known under the old regime.

CO-OPERATION IN INDUSTRY.

The sins of promoters and of all the propagators and practicers of "high finance" have been so engrossing since the day acute indigestion fell upon the security market, that the public has been in no mood to hear of the benefits of consolidation. The addresses before bodies of bankers, manufacturers and merchants and the teeming magazine articles by men of large affairs and small literary aptitude, that were so in vogue three years ago—all telling of the great gain that was to come from consolidations—are somehow all classed together, in the general thinking, with the prospectuses of the underwriters and the promises of the promoters. But, as was pointed out by the abler and more candid of those who appeared before the public as exponents of the new era in industrial and corporate organization, there are both good and bad consolidations, and the abuses and excesses that have come along with big corporations are not to be charged against trusts, so-called, any more than municipal corruption is to be laid at the door of civil government.

Time is correcting many evils that are found in consolidations, and when the wounds inflicted upon investors in inflated securities have healed, a more patient hearing may be given the recital of the good that has been accomplished, than could be expected now. An occasional note is sounded even now, however, emphasizing the benefits of co-operation and consolidation, and we shall expect more definite and detailed statements as history is made and the wasteful and mistaken policies of the experimental days of the consolidations give way to the economies, the system and the compact organization that come with the seasoning process. Speaking to the members of the American Bankers' Association at their recent convention in New York, James Stillman, president of the New York Clearing House, made this reference to the change that has come over the conduct of business:

> The growth of the spirit of co-operation is undoubtedly the most significant phase of the economic development of the present day. Almost beyond calculation are the economic results already attained in the fields of industry and transportation through the elimination of unintelligent competition—that sort of competition which has meant in the end direct and definite loss to every one concerned, loss to the workingmen, loss to owners of property and ultimately loss even to the consumers.
>
> In the management of the country's great industrial undertakings notable progress has been made in recent years in the direction of harmonizing divergent interests, in the wiser comprehension of the value of mutual good understanding, in the juster appreciation of the right of competitors. Such progress in the direction of true co-operation has resulted in vast additions to the wealth of the country, as real as would have resulted from the discovery of new mines, the making productive of desert fields or the acquisition of new sources for the supply of raw material.
>
> In the field of industry, the beneficent economic results which followed this awakening to the value of co-operation have become too obvious to need any word of emphasis. In the field of finance, however, there is not yet such general recognition of the value of co-operation. I believe there is no more important thing left for bankers to learn. When we come to fully appreciate the great economic value of co-operation, when we see more clearly the waste which follows unintelligent competition and understand that such waste means

as complete a loss of wealth as comes with a disastrous fire or a blight of crops, we shall have brought into the business of banking something of the modern spirit which has so marked the present day development of industrial affairs.

Representing banking interests that have had better opportunity than any others to know the mistakes and worse that have attended the efforts of the past three years to abate the evils of unrestrained competition, Mr. Stillman's tribute is significant. Yet consolidations represent but a single phase of the movement that has made such headway in the past five years. More than is appreciated by the public, or even by labor leaders, has co-operative effort by manufacturers been counting in the settlement of the labor question. Manufacturers themselves often fail to grasp the significance of the great association movement that has taken possession of industry in so many lines, with the express purpose of turning the tide that was running so strongly in line with the plans of unbridled trade unionism. Time may even demonstrate that this form of co-operation among manufacturers has been a more tremendous and significant development of the early years of the 20th century than the gigantic trust movement itself.

The Labor Situation.

CINCINNATI MOLDERS' STRIKE.

There has been no change in the strike situation in Cincinnati foundries so far as any outlook for a termination of the trouble is concerned. There was quite a riot at the Eureka foundry on Friday, Sept. 23, in which several men were badly injured. The National Foundrymen's Association is getting more men to take places in the foundries and three foundries were to be started up on Wednesday, Sept. 28. The employers still maintain that they will fight the strike to a finish and will hereafter run open shops.

The officers of the Iron Molders' Union of North America and the Cincinnati unions of molders were enjoined Sept. 26 by Judge Hosea from in any manner interfering with the business of the Eureka Foundry Co., or from interfering with its employes in working or in any way unlawfully persuading them to cease work, or from preventing any one from going to work for the company if he desired to do so. Judge Hosea said that, "until the officers of a union take official action disclaiming violence and expel the members guilty of such acts, they will not stand well in the courts." He cited the instance of an officer of a union paying the fine of a member of the union convicted of assault when the plumbers' strike was on, and yet coming into court and disclaiming sympathy with such act. Another decision and temporary injunction was issued by Judge Thompson, at Cincinnati, on application of the Newport Iron & Brass Foundry Co. The judge explained that peaceable persuasion is not unlawful, but that the gathering of large numbers of men in the vicinity of shops is not peaceable. He specified picketing as a thing to be included in the restraining order.

INTERNATIONAL HARVESTER CO. RESUMES.

The International Harvester Co. resumed work at the Deering, McCormick and Plano shops last Monday after an idleness extending over several weeks. The shops have been in readiness for some time, but owing to the expiration of the union agreements this month, made in September, 1903, it was decided not to start up until after this had elapsed. No renewal of the agreements will be made, and while it is not the intention of the company to discriminate against either union or non-union labor, it will in future operate its plants on the strictly open-shop principle, as was the case before the strike of last year. Every department is working full, the men in each case being glad to return to work and no trouble is anticipated with the labor unions. The wages will continue the same as before the shut-down, the only change being that the working hours per day have been increased by one hour. Before the strike of last year, the shops ran ten hours a day, or sixty hours a week. After the strike, the nine-hour day was inaugurated or fifty-four hours a week at the rate paid for the longer week. Now the company returns to the ten-hour day, or fifty-eight hours per week in the winter time, the shops closing at 4 o'clock Saturday, and a fifty-five-hour week in the summer, when a Saturday half holiday will be given.

NO SETTLEMENT OF THE HOOP MILL STRIKE.

(Special Telegram.)

PITTSBURG, Sept. 29.—The puddle mill at the lower plant of the Carnegie Steel Co., at Youngstown, O., has resumed operations. No settlement of the strike is probable.

METAL TRADES ASSOCIATION NOTES.

The next regular meeting of the administrative council of the N. M. T. A. will take place Oct. 28 at the office of the commissioner in Cincinnati. Commissioner W. P. Eagan returned to the Cincinnati office Sept. 28 after a prolonged stay in Chicago.

The secretary of the Chicago Metal Trades Association is requesting his members not to employ any men except through the office of the labor bureau operated by his association.

The executive committee of the Worcester Metal Trades Association met at the offices of the association on Sept. 22. The principal business was the arrangement for a meeting with a banquet at which Commissioner Eagan will be present on Oct. 11.

A. E. McClintock, secretary of the National Founders' Association, reported there are more men than positions for the shops of his Philadelphia members.

The Employers' Association, of Springfield, Mass., is having a phenomenal growth.

The Manufacturers' & Employers' Association, of Trenton, N. J., has admitted 240 members in six months.

The boilermakers' strike which has been on five months in St. Louis was declared off by a vote of the union and the strikers are applying as individuals for work. No concessions were granted by the employers.

The secretary of the Manufacturers' Association, of Pittsburg, reports that there is no change in the strike situation at the Pittsburg Steel Foundry. This company is working all the molders it wants and is boarding them inside the works.

The strike at the Damascus Bronze Co., of Pittsburg, because of that company's refusal to discharge a non-union man is still on. Non-union molders have been secured, and so far as the company is concerned the strike is over.

Henry M. Leland, of Detroit, chairman of the Tenth District, N. M. T. A., reports peaceful relations existing all along the line in his district.

The Frick Co., of Waynesboro, Pa., calls attention to the fact that there has been no strike of any kind in that city for several years.

LABOR NOTES.

The nine months' struggle of the machinists and boiler makers of the Chicago, Lake Shore & Eastern railroad against a 10 percent reduction ended last week. The company announced that if the unions would call off their strikes it would reinstate as many of the former employes as possible at lower wages. The result was a stampede of more than half of the 400 strikers, which caused fighting and brought out the police. The company hired 100 of the old men.

As a result of an altercation between deputies guarding the foundry of the Pittsburg Steel Foundry at Glassport, Pa., and the striking molders, last week, one deputy was shot and severely wounded. A temporary injunction against the company's former employes was issued some time ago, and a number of strikers who took part in the fight were heavily fined for contempt of court. Several months ago this company decided to operate an open shop, and has all the men required to operate the plant at its present capacity.

The strike of the Canadian Pacific boiler makers at Winnipeg, Man., has been settled, the basis of settlement being that the strikers are to receive an increase of 1 percent. They asked for two cents per hour increase.

NOTES ON AMERICAN STEEL WORKS.

In London *Engineering*, David E. Roberts, of Cardiff, Wales, contributes a series of articles under the above title. We make some extracts below from the first two installments, which are interesting chiefly for their comparison between British and American practice. The references to American ore-hauling equipment do not draw these comparisons, and as they contain only familiar statements we omit them:

Managers and owners of British steel works are sometimes blamed for their reputed lack of enterprise in not boldly uprooting their plant and modernizing on American lines. The conditions, however, that exist in the United States differ so widely from those that hold good at home that it may be said a wise discretion is exercised in not implicitly following American designs. There are, nevertheless, lessons full of interest to be learned on the other side of the Atlantic, and these must be beneficial if used with discrimination. The gigantic ore-handling systems, the extensive blast-furnace, Bessemer and open-hearth plants, and the splendidly-arranged mills, will all reward close attention and study. The variation from home practice is considerable in every department, and one cannot help feeling a desire to describe some of the interesting features, in however imperfect a manner, for the benefit of those who have not been to see them. It is not easy to decide upon the best line to take, because so much has already been written upon the same subject. It is found, however, that the "general arrangements" of works have been more fully dealt with than have the minor methods employed. These latter, though small in themselves, are very important to success, and are especially so in the rolling-mills.

* * *

Blast Furnaces.—The furnaces continue to be on an immense scale and are driven very fast; No. 5 Carrie is a fair example. There are 15 tuyeres, each 5 in. in diameter, and the blast pressure is anywhere up to 28 lb. The load-line is kept generally about 80 ft. up. The top portion of the furnace, where charging wear is greatest, is built entirely of 2-in. nickel-steel plates. There are eight columns under the lintel, and eight columns run also right up to the top of the furnace and support the whole of the superstructure. This furnace makes about 460 tons in 24 hours. There seems to be a tendency growing now towards the use of smaller furnaces. Makers hold that they have gone a little too far of late years, and that economy has not kept pace with them. As is, perhaps, well known, it is the universal practice to couple each furnace independently to its own blowing-engine, which runs at a constant speed, sending into the furnace a fixed number of cylinderfuls of air per hour. The pressure is not noted—it may be anything, and varies with the condition of the furnace. If the furnace is hanging, the pressure may rise to 28 lb.; and if coming down well, it may drop to 8 lb. The quarter-crank and the single-tandem horizontal types of engine seem likely to become the favorites. Steam turbines are not yet in use, neither are gas-engines using blast-furnace gas, excepting some that are now being put down at Lackawanna.

Steel Works.

Open-Hearth Plants.—The open-hearth plants are laid out on very extensive lines. The No. 3 shop at Homestead is one of the largest and makes about 60,000 to 65,000 tons a month. There are two rows of 50-ton furnaces all working basic. The excellent crane equipment is a noticeable feature; the casting cranes, built with ladle-guides to prevent swing, are of specially massive construction. In this shop the ladle stands in a pit about 6 ft. deep when being filled, but in some of the shops the floor level is lowered throughout, and no pit is used—the pits being troublesome to keep clean. Nearly all the furnaces in the Pittsburg district are fixed, the rolling-furnace not being much of a favorite there. The checkers are placed pretty well away from the furnace ports, and are often under the landing. The valves are well designed and are placed so that they can be easily got at. The furnace doors are water-cooled, and are lifted pneumatically. The Wellman (low-type) charger is in general use, and is a good tool; but the bulk of the metal is charged molten. The bogie truck used to take away large masses of scull and slag is built entirely of steel castings, and is a strong and simple carriage.

There is a 200-ton Talbot furnace at work at Jones & Laughlin's, and it is of their own construction. They have had considerable trouble with this furnace, but have at last succeeded, with great ingenuity, in bringing it into good working shape. One of the greatest troubles was the keeping up of the roof, partly because of the great difficulty of so arranging the ports that the flame should be spread evenly over it. The lining on the landing side also has fallen in a number of times when the furnace was pouring. Other furnaces of the same type are going down, but it is said that this is because there is not room to put down sufficient furnaces of the ordinary open-hearth type to give the required output. The writer was shown by the Garrett-Cromwell Engineering Co. an arrangement, got out by their Mr. Lash, by which the ordinary plant possessed by steel-makers was said to give the good points of the Talbot process without the great expense and risk of the monster furnace. For their duplex system four 50-ton open-hearth furnaces, two Bessemer converters and a mixer are required; but this plant is what most steel people have. The method consists in placing in the open-hearth furnace one-fourth of the charge—viz., 12½ tons—direct from mixers, and blowing in rapid succession the other three portions, adding each to the open-hearth furnace until the 50-ton charge is complete. It is found that when the large quantity of Bessemerized metal with the basic material is added to the bath, a violent reaction is set up, similar to that obtained in the Talbot process. The charge is finished off as in the usual open-hearth process.

Bessemer Works.—There is less variation from home practice to be found in the Bessemer than in any other department of the works. English Bessemer shops are quite as well equipped mechanically; but the low-silicon iron in America needs much faster working. The blows are very short, and to keep the vessels hot the stops between the blows are also very short. The vessels, bottoms, blast, and turning arrangements are similar to those at home. In most shops it is contrived to place the ladle on a stand for teeming, so that the crane may be free to deal with other casts. At Braddocks there are four vessels, but seven ladles are generally kept on the go, and there are four teeming-stands. The same ladle-stopper is frequently used about four times over. Car casting, stripping, etc., as now frequently seen at home, are universal in American Bessemer works. The iron used in the Bessemer is generally melted in cupolas, the direct iron going to the open-hearth furnaces. Some of these cupolas do good work, and may be worth describing; we will give a short account of those at Homestead. There are four, and they stand in a row, about 20 ft. above floor-level. They are 31 ft. high and 11 ft. in diameter, have drop-bottoms, and each is supplied with blast (cold) by its own fan. There are eight tuyeres per cupola, each being composed of an 8-in. earthenware pipe, and they are set about 5 ft. from the bottom. The cupolas are lined with a local sandstone, containing about 92 percent of silica and 6 percent alumina. The stone easily splits, and is generally used in blocks about 24 in. by 18 in. by 6 in. The jointing material is composed of 25 percent fireclay and 75 percent ground silica stone (quartzite, 99 percent silica). The lining round the hearth is 24 in. thick, and runs out to about 10 in. thick at the top, the last foot or two being lined with cast-iron blocks to stand the wear of charging. The bottom is made by first laying on the doors a 6-in. layer of coke-dust, and upon that a further layer, about 4 in. thick, of ground silica rock and loam mixed (half and half). Each cupola needs relining about once every four months. The Bessemer converters are lined with the same material.

The plates forming the shell of each cupola are all bolted together with flanges, to make the changing easy. The fans deliver air to the cupolas at a pressure of about 8 oz. to 9 oz. per square inch. Each fan is direct driven by electric motor, running about 800 to 900 revolutions per minute, and developing about 45 horse-power. The power required to drive a fan is sometimes underestimated. It should be borne in mind that if, under fixed conditions, the speed of a fan is doubled, the power required to drive it is practically increased eight times. For satisfactory results both fan and motor should be of the large size, and sharp bends and contracted areas, of course, avoided. If an installed fan is not large enough, it is more efficient to add another to it, or to put in a larger one, than to speed it up very much. It is well, too, to have the pressure-gauge on the cupola-belt in sight of the melter. The four cupolas described have melted between them 1895 tons in 24 hours, and 42,600 tons in a month's working.

(To be continued.)

AMERICAN INSTITUTE OF MINING ENGINEERS.

The second week of the eighty-seventh meeting of the American Institute of Mining Engineers, in the Lake Superior region, was in the "copper country," of Houghton county, Mich., and at the iron mines of Ishpeming, Marquette county. The weather was as favorable as it had been during the Duluth and Mesabi trip, and the visitors expressed themselves as surprised at the glorious fall climate of the Northwest. It added much to the pleasure of their trips. This party differed materially from many that pass through the same region, in that it waved aside attempt at formal banquets and receptions, etc., and was willing to submit to but one public function, the reception at the Northland Country Club, at Duluth. The visitors especially astonished copper country hosts in their abstemiousness and desire for nothing but an opportunity to inspect mine and mill. The entertainers, on their part, were greatly pleased at the remarkably high character and standing of the visitors. Almost every man among them was either general manager or president of great works in this country, Mexico or Europe, and it is safe to say that a higher grade body of men of a splendid constructive profession was never brought together in the Northwest. A great share of the present day success of America, and much of that of Germany, in furnace practice, metallurgy and mine operation, is due to men who were on all or a part of the trip between Duluth and Ishpeming. The entertainers also remarked at the respect in which the secretary of the institute was held, and at his remarkable versatility. Dr. Raymond was called on during the visit to exhibit this to the full in the off-hand translation of a deeply technical paper delivered by Prof. Osann in German, on the chemical processes of the blast furnace in impromptu, but delightful responses to addresses of welcome, both at Duluth and Ishpeming, in music with the German chorus at the institute's Hibbing entertainment, and in a most scientific, broadly cultured and altogether delightful Sunday sermon delivered in the First Presbyterian church at Duluth. That members of the institute knew what they wanted to find out, and went after it in the quickest and most direct manner, was no surprise to the natives, but the amount of information assimilated during the visit was really a remarkable thing after all.

The Mines at Ishpeming.

At Ishpeming, where the party found itself on Wednesday, the early morning was spent in an inspection of the great Lake Angeline basin, which was once a lake, but is now the roof of three important mines operated by as many companies. Above this rock roof and in the basin of the lake bed is a thick coating of mud, and mining methods have been carefully worked out with reference to this factor of the problem, and with the utmost success, for there has been but trifling trouble from this capping. This mud is so soft that it will run like water if given an opportunity to make its way into underlake openings. The Pioneer furnace wood carbonizing plant and by-product works of the Cleveland Cliffs Iron Co. at Marquette, was found in full operation, making 140 tons of charcoal iron, about the same of charcoal, 20,000 lb. of acetate of lime, 2,500 gallons of wood tar, and 1,200 gallons of refined water white 95 percent methyl alcohol daily. The use of waste gases, of water condensed from the chemical processes and put through turbines, of superheaters and mechanical stokers at the steam plant, and of electricity throughout, was a most interesting application of advanced construction and was the cause of much comment. The retorts of the carbonizing plant are charring about 320 cords of hard wood daily, coming off lands of the Cleveland Cliffs Co. on the line of its Munising railroad.

That afternoon there was a lunch at the house of the Ishpeming Golf Club, at which Hon. H. O. Young, member of congress from the upper peninsula, made a happy address of welcome, in which he instanced the many Northern Michigan men who had gone out to all parts of the world as engineers and were now conquering the earth's mineral problem from Alaska to the south seas and from Siberia to Patagonia. Most of the men mentioned were personally known to at least some of those present, and his reminiscences brought up much that was pleasant. Secretary Raymond responded in a touching and pathetic tribute to the older men, who were going off the stage and giving way to the younger ones of the great profession he represented. At the close of the lunch President Gayley announced that carriages were in waiting to take members where they wished to go, and the remainder of the day was passed in drives about the town, to Marquette and the Cliff road, and by some in going underground in one of the Cleveland Cliffs' mines. The session then adjourned, and the visitors returned to their homes. A subordinate session, to which some of those present went, is to be held at St. Louis this week.

Two Days at the Copper Mines.

Two days were passed among the copper region mines, from the Wolverine on the north to the Champion on the south, taking in Tamarack, Calumet, Atlantic, Champion and Baltic. Only a very brief summary of points of most interest can be given. Wolverine was inspected underground, and astonishment was expressed by those fortunate enough to make the trip at the wonderful way in which the hanging wall held up. The lode here pitched at an angle of about 40 degrees, and for a width of nearly 1,000 ft. and a height on the pitch of 400 to 500, the lode is mined out with a very few 30-ft. pillars and an occasional floor varying from 2 or 3 ft. to 6, to hold it all from coming down. The shafts are sunk without timber and with only 30-ft. walls on either side. The mine uses no timbering underground, the openings are not back filled and it does not cave. Wolverine is making about 8,000 lb. copper per month, and at the rate of 30 lb. to the ton of rock treated. This is as high as the best work of any amygdaloid mine in the region and is next only to the conglomerate lode of the Calumet and Hecla.

Tamarack's magnificent surface equipment at No. 5 shaft, which is 4,938 ft. deep, consists of a 6,500-h. p. Nordberg four-cylinder engine operating a double conical drum, the ends of which are 16 ft. in diameter and the center 24 ft. This drum runs two 6-ton skips in balance, each with 6,500 ft. of 1½-in. cable and the hoisting is done at the rate of 3,000 ft. per minute. This shaft has a full duplicate hoisting plant. It was sunk in six years on the assurance from the manager of the company that he would cut the lode at a certain depth and in a certain time. The work was actually done within eleven days of the time set, and the lode was found 12 ft. deeper than anticipated. The lode is the Calumet conglomerate and its pitch is almost perfectly true.

Surface machine plants at various Calumet plants showed a bewildering array of engines and compressors of almost every type, from the walking beam and an 8,000-h. p. quadruple hoist, at the Red Jacket, hoisting 10-ton loads 4,000 ft. a minute, to the latest Nordberg or an Allis 1,500-h. p. twin vertical tandem compound expansion direct connected operating a 1,000-k. w. alternating current generator of the General Electric type. Some Calumet machinery is a fearful and wonderful sight. The property has about 70,000 h. p., including hoists, pumps and generators, most of them in duplicate. There are 130,000,000-gallon daily pumping capacity at the mills, for the purpose of handling sands in and below the stamps, and for hoisting waste sands to launders. Practically 6,000 tons of tailings are run off into Lake Linden daily, and this is elevated by a 64-ft. sand wheel to launders. The company has three of these wheels, one of 40, one of 50 and the newest of 64 ft. diameter. Calumet mills contain 28 stamps, of an average capacity of over 500 tons rock daily. This conglomerate rock is easier to stamp than the harder amygdaloid of the other Lake mines. It is supposed to carry about 50 lb. refined copper to the ton. One of these mills is steel construction, the other is to be, and when rebuilt the two will treat about 10,000 tons of rock per day, or more than the three largest gold mines of the world combined. Calumet owns about 1,200 dwellings, which are leased to operatives at enough to pay a low rate of interest, and the town contains about 40,000 people, most of whom are supported more or less directly by this mine.

Two New Copper Mines.

Champion and Baltic are new mines, the first opening in each having been made about five years ago. They are making more than 1,000,000 lb. copper monthly each, about half the copper the present plants are capable of. They are steadily increasing. Both are opened on the so-called Baltic lode,

which is the oldest amygdaloid in the region and carries a high percentage of copper. Both mines are splendidly equipped with machinery especially adapted for their requirements and good for hoisting from 1,500 ft. and lower. Baltic mill is perhaps the most improved in the region with the exception of the new Osceola, and was an interesting spectacle. Osceola's mill, by the way, has one steeple compound stamp that is crushing 700 tons of hard amygdaloid per twenty-four hours and has made a record of 725 tons daily for a week. This stamp is showing an economy of 30 percent in steam over single cylinders in the same mill. Champion is making openings at the rate of about 7,000 ft. annually and has now, since 1899, more than 6½ miles of workings, with four shafts averaging better than 1,000 ft. depth. It is running on very rich rock and is splendidly opened. Atlantic was visited. It is the leanest mine in the world, its rock averaging a value, at 12.5 cents a pound for refined lake copper, of about $1.70 a ton. From this it is making money and will pay a dividend this year. But the visitors were treated to a surprise by the presentation of specimens of rock out of its ashbed lode that averaged 10 percent copper. Atlantic and Baltic use a dam on Salmon Trout river that impounds 1,250,000,000 gallons of water and saves pumping to the mills, averting a cost of at least 2 cents per ton of rock. This is a steel gravity dam, of interesting design, and is surmounted by a trestle of the Copper Range road.

At the Michigan Smelting Works, built by the Stanton and Paine interests and designed to serve their mines, the especially interesting thing was the mechanical casting of refined copper from furnaces, which is in direct opposition to the hand methods employed at Calumet and the combination of hand and mechanism at Osceola. The question of oxidation of molten copper during the pour is being fought over by advocates of the two methods. This works is the largest in the district with an ultimate capacity for 60,000,000 lb. copper and contains the biggest reverberatory furnaces ever built, with capacity for 90 tons a day each.

The report that the Westinghouse Electric & Mfg. Co. is going to remove its plant from East Pittsburg, to Newark, N. J., owing to the difficulty experienced in retaining skilled workmen has been officially denied. The company has operated a plant at Newark for many years, for the production of electrical instruments and light electrical apparatus and the capacity of this plant is to be considerably increased in the near future. It is also probable that one department whose production is along the same lines as the product turned out at Newark will be transferred from the East Pittsburg works, to make room for the constantly increasing demands made on this plant. With its tremendous investment in buildings and real estate, and its recently completed departments, it is hardly probable that the East Pittsburg site of the company would be forsaken.

PITTSBURG, Sept. 28.—The Wabash railroad is asking for bids on 4,000 tons of structural steel for its new freight house building, 800 x 150 ft., two stories high.

At McKeesport, Pa., the National Tube Co. is rebuilding its entire finishing department, but the work is necessarily slow, inasmuch as the output of the plant must not be interfered with while the work is progressing. This week the building containing the threading department was moved a distance of 300 feet without causing any interruption in operations, the ground vacated to be occupied by a new 12-inch mill.

The third Bessemer steel converter and the Soho furnace of the Jones & Laughlin Steel Co. resumed operations Sept. 26.

A charter of incorporation has been granted to the Doty Engine Works Co., Ltd., capital $40,000, head office, Goderich, Ont. The provisional directors are Frederick W. Doty, Charles W. Doty and Mary E. Doty, all of Goderich.

Two hundred of the leading chemists of Europe, including many of international fame, members of the Society of Chemical Industries of Great Britain, spent Friday and Saturday of last week in Chicago, arriving there from St. Louis.

SCIENTIFIC METHODS AND THE LABOR PROBLEM.*

BY H. L. GANTT.

The greatest problem before engineers and managers today is the economical utilization of labor. The limiting of output by the workman, and the limiting by the employer of the amount a workman is allowed to earn are both factors which militate against that harmonious co-operation of employer and employe, which is essential to their highest mutual good.

Scientific investigation is rapidly putting at our disposal vast amounts, of knowledge concerning materials and forces, which it is the business of the engineer to utilize for the benefit of the community. Well designed plants and efficient labor saving devices that are to be seen on every hand bear testimony that he is doing at least a portion of his work well. When, however, it comes to the operation of these plants and the utilization of these labor saving devices, the lack of co-operation between employer and employe, and the inefficient utilization of labor very much impairs their efficiency. The increase of this efficiency is essentially the problem of the manager, and the amount to which it can be increased by proper study is, in most cases, so great as to be almost incredible.

In considering the subject of management, we must recognize the fact that in this country so long as a man conforms to the laws of the State he has a right to govern his own conduct and to act in such a manner as his interests seem to dictate. Granting this, it follows that any scheme of management to be permanently successful must be beneficial alike to employer and employe, and neither labor unions that regard their interests as essentially antagonistic to that of the employer, nor employers associations whose only effort is to oppose force with force, can ever effect a permanent solution of the problem of the proper relation between employers and employes.

Boards of arbitration are temporary expedients, and the results of their work are seldom better than a sort of Missouri compromise, to be fought out later; for, although they be composed of men of the highest intelligence and of the greatest integrity, the conditions under which they are organized and the means at their disposal never enable them to get more than a superficial knowledge of the subject. The information such a board gets is all in the form of testimony, which, although it may be honestly given, can never produce a complete understanding of the subject, for, as a rule, neither employer nor employe knows exactly in detail the best way of doing a piece of work, and, as far as the writer's experience goes, they *never know exactly how long it should take a good man fitted for the work and provided with proper implements.* Before intelligent action can be taken in any case these facts must be known.

In order to get a general idea of the conditions that exist in the mass of our manufacturing industries it is necessary to review briefly the manner of their development. The expert mechanic, who, with a business growing to larger proportions than he could take care of, hired a few men to help him, and directed them all by his personal example and skill, first gave place to the small factory, which he could run on the same lines. Today, however, even the smaller factories have grown beyond the point where they can be directed or controlled by one man, and methods which were successful on the smaller scale fail now to apply on the larger.

The factory is divided into departments, each directed by a foreman, who in many cases has had no training in management and oftentimes has no capacity for it. He is invariably overworked if he attempts to do his duty and the manager seldom has time to inquire into his troubles, but frequently tries to remedy matters by appointing another foreman, often making matters worse.

Again, if expenses are too great, and it seems impossible to meet competition, there is seldom any serious effort made to find out why expenses are too high, but it is assumed that the way out of the difficulty is to reduce wages. It never appears to occur to a manager that perhaps the cause of the excessive expense may not lie with the workman, but with the management. Managers rarely seem to suspect that, if the workmen were more intelligently directed, the output per man might be largely increased without a corresponding increase in expense.

Those who have given even superficial study to the subject

*Read before the International Congress of Arts and Science at World's Fair, St. Louis, September 23.

are beginning to realize the enormous gain that can be made in the efficiency of workmen if they are properly directed and provided with proper appliances. Few, however, have realized another fact of equal importance, namely, that to maintain *permanently* this increase of efficiency the workman must be allowed a portion of the benefit derived from it. To obtain this high degree of efficiency, however, the same careful scientific analysis and investigation must be applied to every labor detail as the chemist or biologist applies to his work. Wherever this has been done, it has been found possible to reduce expenses and, at the same time, to increase wages, producing a condition satisfactory to both employer and employe.

The great difficulty in instituting this method of dealing with labor questions is that usually neither employer nor employe has sufficient knowledge of the scientific method to realize either the amount of detail work necessary, or the extent of the benefits to be derived. In general, their inclination is to adhere to the methods with which they are familiar, and to distrust all others, even though their methods have failed to bring them appreciably nearer the solution of their problems, and the newer methods have produced results far more satisfactory than they even hoped for.

A scientific investigation into the details of a condition that has grown up unassisted by science has never yet failed to show that economies and improvements are feasible that benefit both parties to an extent unsuspected by either.

The science laboratory for the study of materials and forces, originally considered as belonging only to educational institutions, has recently become a recognized necessity in all our large industries, and to it principally the great advance of recent years has been due. As yet, however, in but few cases has any definite attempt been made to study in a scientific manner the most efficient way of utilizing the human labor. Of how much work of various kinds the ordinary man has done, we have many records, but of how much a man specially suited to any class of work can do, we have almost no knowledge. Enough study has been spent on the subject, however, to determine that men specially suited to any particular kind of labor, if supplied with proper implements and intelligently directed, can do on the average at least three times as much as the average workman does if the limiting factor is physical exertion and, if assured sufficient compensation, will do so day after day.

The ratio of what can be done to what is done is even greater than three to one in work requiring skill and planning. Well thought out plans, accompanied by complete instructions for doing work by the best methods known, often produce an increase of more than 100 percent over what is usually done, for complicated work, which should be planned most carefully, is often not planned at all, but left to the judgment of a foreman whose first knowledge of what is to be done reaches him with the order to do it. In such a case, it is the exception when the work does not cost in wages at least four times what it should, and this with no fault of the foreman or workman.

These facts have been established in numerous cases of ordinary labor, in doing machine shop work, in building engines, and in the erection of structures of various kinds. Similar possibilities have been indicated wherever the slightest effort has been made to study or to plan, showing that in many instances condition of affairs exists which is not only wasteful to the owners, but discouraging and unjust to the workmen, most of whom would be willing to do more work to earn increased pay if only the opportunity to do so were offered, and they were guaranteed that they would not ultimately lose by doing so.

Mr. E. F. DuBrul, until lately commissioner of the National Metal Trades Association, an organization of employers formed to protect themselves from the unjust demands of the labor unions, stated not long ago that a large majority of strikes were produced by mismangement. Mr. DuBrul has perhaps had more general experience recently with striking employes than any other man in this country, and his conclusion is that the best insurance against strikes is good management. He therefore strongly advises managers to study the subject. The necessity for this advice will become evident when we realize that hardly any two managers, unless they have been trained under the same influence, agree as to the proper way of dealing with any of the intricate questions that are constantly arising between employer and employe; much less will they agree on any general principles of management.

There have been and are today great managers. Are there not some general principles by which they either consciously or unconsciously are governed? In other words, are there not some general principles, applicable at least to a large number of cases according to which substantial equity can be insured between employer and employe and a higher degree of efficiency realized from their harmonious co-operation?

The only successful method of determining general laws has been that of *scientific investigation*, and in the study of questions involving human labor, enough has been done to show that the same method is applicable to at least a large number of individual cases, and there is good reason to believe that it is universally applicable.

Labor unions demanding all they can get, and employers' associations organized to oppose the demands of the unions, can never evolve a satisfactory system of management, for although each, in its way, may be and undoubtedly is often beneficial to its members, both are formed with the idea of using force only, which can never be a substitute for knowledge.

Although a board of arbitration may be useful in averting a crisis, the decision of such a board founded on such facts as are available should be professedly only temporary in character, to be revised later according to the results of a scientific investigation of the matter in dispute, to be undertaken at the earliest possible date.

This problem consists of three parts: 1. To find out the proper day's task for a man suited to the work. 2. To find out the compensation needed to induce such men to do a full day's work. 3 To plan so that the workmen may work continuously and efficiently.

The first part of the problem is the difficult one, for a man suited to the work must be found and induced to work at his full capacity. The details of the work must be arranged so that he can work most efficiently, and the time to do each detail must be carefully studied with a stop watch.

From such detail observations it is possible to determine what a good man can do every day, and there is but little difficulty in finding out what men have to be paid to make them do all they can, for although men as a rule prefer to sell their time, and themselves determine the amount of work they will do in that time, a very large number of them are willing to do any reasonble amount of work the employer may specify in that time, provided only they are shown how it can be done and guaranteed substantial additional amounts of money for doing it. The additional amount needed to make men do as much as they can depends upon how hard or disagreeable the work is, and varies from 20 to 100 percent of what they can earn when working by the day according to their own methods and at their preferred speed.

The cost of such investigations is necessarily large for they can only be made by capable men who have had the special training necessary, and hence the expense must be borne by the employer; but the returns, when the results of these investigations begin to be applied, are, in a short time, so great as to pay for the investigations, allow a substantial increase of wages to the employe and leave a good margin of profit to the employer.

The benefits which have been derived from such investigations are: an increase of output, a decrease in cost of product, better workmen attracted by higher wages, and improvement of quality of product due to better workmen and more careful supervision.

These results are well worth striving for and the fact that they have been obtained by the application of the scientific method to the ordinary problems indicate strongly that progress is to be made in such matters by the same methods that have been responsible for other kinds of progress in the past. This detailed study of the elements of every labor problem was first made by Mr. Fred. W. Taylor, who for over twenty years was the only man to apply the scientific methods rigidly to this subject, and today the people doing this work most thoroughly are those trained under his influence.

There are in this country today at least 20,000 employes whose tasks and compensation have been directly influenced by such study. They are all doing more work and earning more money than those engaged in similar work under the old methods, and there has never been anything in the nature of a strike among them.

AMERICAN INSTITUTE OF MINING ENGINEERS

AMERICAN INSTITUTE OF MINING ENGINEERS—87TH MEETING.

(From a photograph taken at Mahoning Mine, Mesabi Range, Sept. 17, 1904.)

[Names in order from left to right.]

Bottom Row: F. W. Getty, Chicago; W. C. Agnew, Duluth; Jules Goujon, Moscow, Russia; Walter Wood, Philadelphia; Thomas Owens, Duluth; Paul S. King, New York; C. W. Kieswetter, Duluth; H. H. McNamara, Duluth; George D. Swift, Duluth; Harry Thomas, Hibbing; G. G. Hartley, Duluth; John Uno Sebenius, Duluth; Joseph B. Cotton, Duluth; R. R. Trezona, Eveleth; Hanz Mentzel, Bochum, Germany; W. J. Olcott, Duluth; George Bartol, Cleveland; Theodore Beckert, Breslau, Germany; Max Ludwig, Eisleben, Germany; H. L. Dresser, Duluth; R. F. Goetze, Bochum, Germany; Kirby Thomas, Superior, Wis.; D. B. Meacham, Cincinnati; F. S. Witherbee, New York; W. N. Merriam, Duluth; H. B. Sturtevant, Duluth; C. H. Munger, Duluth; J. Lodge, Tuscaloosa, Ala.—**Second Row:** W. G. LaRue, Baraboo, Wis.; J. B. Gujnn, Joplin, Mo.; G. A. Voskule, Wynberg, S. Africa; W. A. McGonagle, Duluth; Miss Mills, New York; J. F. Lutes, Biwabik; James C. Hunter, Duluth; Mrs. H. W. Craver, Pittsburg; Nelson P. Hulst, Duluth; D. T. Croxton, Cleveland; H. W. Craver, Pittsburg; A. H. Eustis, Boston; G. E. Abbott, Eveleth, Minn.; Ralph Gillette, Minneapolis; Dr. R. W. Raymond, Brooklyn; Prof. Osann, Clausthal, Germany; Miss Rachel Wood, Philadelphia; Theodore Dwight, New York; B. F. Fackenthal, Jr., Easton, Pa.; A. R. Bellenger, Syracuse, N. Y.; Dr. H. B. Kummel, Trenton, N. J.; S. W. Croxton, Cleveland; W. A. Barrows, Jr., Sharpsville Pa.—**Third Row:** Jawood Lukens, Conshohocken, Pa.; Mrs. G. B. Richards, Buffalo; Master Richards, Buffalo; A. J. Rossi, New York City; Mrs. Julian Kennedy, Pittsburg; Mrs. George D. Swift, Duluth; T. F. Cole, Duluth; Mrs. L. Holbrook, New York; Amos Shepherd, Hibbing; Levi Holbrook, New York City; E. S. Hutchinson, Newtown, Pa.; Miss M. Wood, Philadelphia; Howard Wood, Philadelphia; F. Z. Schellenberg, Pittsburg; Mrs. J. Lukens, Conshohocken, Pa.; Mrs. R. W. Raymond, Brooklyn; Mrs. K. Thomas, Superior, Wis.; Mrs. A. H. Viele, Duluth; Mrs. C. Whitaker, Allentown, Pa.; James Gayley, New York City; Mrs. B. F. Fackenthal, Jr., Easton, Pa.; Miss Raymond, Brooklyn; Mrs. H. B. Kummel, Trenton, N. J.; Miss A. A. Mesta, Pittsburg; Mrs. H. B. Sturtevant, Duluth.—**Top Row:** H. J. Wolff, Telluride, Col.; Dr. Joseph Struthers, New York; R. V. Norris, Wilkesbarre, Pa.; J. B. Adams, Duluth; B. J. Vallatt, Virginia, Minn.; Ward Ames, Sr., Duluth; E. F. Remer, Stevenson, Minn.; J. F. Myrick, San Francisco; C. M. Myrick, San Francisco; Julian Kennedy, Pittsburg; F. E. House, Duluth; William Wilkins, Ashland, Wis.; G. L. Collord, Clairton, Pa.; H. C. Farnum, Detroit; F. A. Eustis, Boston; J. M. Sherrerd, Easton, Pa.; A. T. Shurick, Las Esperanzas, Mex.; J. A. Capp, Schenectady, N. Y.; J. M. Clements, New York; Prof. H. Eckfeldt, S. Bethlehem, Pa.; Dr. H. Ries, Ithaca, N. Y.; Fried Koenig, Eisleben, Germany; George J. Krebs, Somerset, Pa.; L. W. Powell, Duluth; T. M. Eynon, Philadelphia; De B. Whitaker, Daiquiri, Cuba; Miss M. Ormrod, Allentown, Pa.; S. H. Pitkin, Akron, O.; G. W. Pfeiffer, Daiquiri, Cuba; Olof Wenstrom, Boston; George Mesta, Pittsburg; C. A. Congdon, Duluth; A. H. Viele, Duluth; L. J. Merritt, Duluth; W. Frentzel, Essen, Germany.

SUPPLEMENT TO
THE IRON TRADE REVIEW,
SEPT. 29, 1904

THE MANUFACTURE OF STEEL CASTINGS.*

BY W. A. HERRON.

In all departments of engineering activity the trend of the times is strongly in the direction of increased power and strength, that greater loads may be drawn, heavier burdens carried, higher speeds attained and increased output secured, all for the purpose of saving time, or lessening the cost of production or transportation. To secure the necessary increase in strength to resist the growing strains of service without at the same time unduly increasing the size and weight of the parts, the engineer has substituted steel for iron castings, and this substitution is going on in all directions wherever a combination of lightness and strength is deemed essential.

The effect of this substitution is more apparent when we consider that the tensile strength of cast steel is from three to four times as great as that of good cast iron. And this is not the only advantage possessed by the steel, for cast iron is more or less brittle and offers but feeble resistance to fracture from shocks, while steel, particularly if properly annealed, offers great resistance to failure from that cause.

There are several processes in use for making cast steel, namely, the crucible, the Bessemer and the open-hearth. The oldest of these is the

Crucible Process.

For more than one hundred and fifty years it has continued in use with little variation in the methods employed. As its name implies, the metal is melted in pots, or crucibles, made of fire clay or plumbago and holding one hundred pounds or less. These pots are placed in melting holes, or chambers, about three feet deep and two feet square, lined with fire brick. The tops of the chambers are about level with the floor of the casting room, and they are covered with iron lids, also lined with fire brick. Several of these chambers are placed in a line, each communicating by means of a flue with a single stack which serves them all. The pots are put in the holes by means of tongs and are removed in the same way. When coke is used as fuel it is piled all around the crucible up to the top, which is covered with a lid made of the same substance as the crucible. In this country the usual fuel is producer or natural gas, instead of coke, and in that case the furnace is supplied with checkerwork below to heat the gas and air, as in the open-hearth furnace. Various mixtures are used in the crucibles to produce steels of desired qualities. For highest grades blister steel, or steel made of Swedish iron bars heated to redness in a bed of charcoal, is melted in the crucible; or Swedish iron bars may be melted and brought to the required temper by putting charcoal in the pot; or blister steel may be melted with mild steel scrap; or broken pig iron of pure quality may be melted with Swedish iron. The latter is the usual practice in the foundry. In this country very little if any Swedish iron is now used in the manufacture of crucible steel, it having been replaced by a pure wrought iron of domestic make.

When the metal has been melted ferro-manganese or spiegeleisen is added to give the steel the desired composition and it is then pourned into the casting molds. It will be apparent that steel made by this process is best adapted to the manufacture of small castings, but the product of many pots may be mixed in a ladle, and castings of large size have been made in this way.

Bessemer Process.

The operation as applied to a foundry is as follows: The mixture of pig iron and scrap is melted in a cupola, from which it is drawn off into a ladle and carried to the converter into which it is emptied. The converter is a pear-shaped metal vessel lined with some highly refractory substance, such as gannister or fire brick, open only at the top or small end and supported on trunnions so that it can be tipped for the purpose of charging and discharging the metal. One of these trunnions is hollow, and through it air is blown at a considerable pressure into a blast box attached to the bottom of the converter, from which the air passes through small tuyeres into the body of the converter and thus through the molten metal, escaping out of the opening at the top. When the flame drops, the silicon, manganese and carbon have been burned out and it is only necessary to add the proper amount of ferro-manganese, if mild steel is required, or spiegeleisen, if steel of higher carbon is wanted, when the steel is ready to be run out into a ladle and carried to the molds.

This process is now but little used in the manufacture of steel castings, having been superseded by the open-hearth process, on account of the superior quality and greater uniformity of the steel made by the latter. For small castings, however, a modified Bessemer process, such as the Tropenas, is sometimes used. The Tropenas converter is usually of about two tons' capacity, so that small heats may be made.

Acid Open-Hearth Process.

In this process, invented by Sir William Siemens and first put into successful operation about 1868, the metal, consisting of pig iron and steel scrap, is melted on the bottom or hearth, of the furnace without contact with any solid fuel. The furnace, which is rectangular in shape, is constructed of structural shapes and plates firmly bound together by means of tie rods and lined with a highly refractory silica brick. The bottom, or hearth, is covered with very pure silica sand. Underneath the furnace proper are four large chambers, two at either end, called regenerators, which are filled with fire brick laid loosely in rows with an air space between each two rows, and each course is laid at right angles to the course below, forming checkerwork. Two of these regenerators, one at either end of the furnace, are for air and the other two for gas. The usual fuel is producer gas, but in this district natural gas is much used. When producer gas is used the gas passes through a pipe or flue from the producers to the bottom of the gas regenerator at one end of the furnace and up through the checkerwork through ports into the furnace, where it mingles with the air coming up through the air regenerator, and combustion then takes place. The products of this combustion pass out of the furnace through the ports at the other end into the regenerators and thence to the furnace stack. The checkerwork is thus heated to a great heat and it in turn heats the air and gas as they enter the furnace when the flow is reversed, as it is every fifteen or twenty minutes. When natural gas is used it enters at the ends of the furnace proper, where it mingles with the heated air coming through the ports, and all four regenerators are used for air. By this method sufficient heat is generated to oxidize the silicon, manganese and carbon, and when that has been effected ferro-silicon and ferro-manganese are added. Pig iron is sometimes added to increase the carbon, or ore to reduce it, as the tests may show to be necessary.

In all of these processes the phosphorus and sulphur are not affected, and the materials used should contain somewhat less of these elements than is desired in the steel.

Basic Open-Hearth Process.

In this process the furnace is practically identical with the acid furnace, except that in the basic the bottom is made of a neutral material called dolomite, a compound of lime and magnesia, and the brick lining to a point above the bath is made of the same material or magnesite. Lime additions are made to the furnace during the working of the charge to reduce the phosphorus in the metal, forming phosphate of lime, which is carried off in the slag. Sulphur is reduced somewhat by the manganese in this process, but the results are variable and it is best to use metals low in that element. The basic furnace is used largely in steel works making rolled steel products because cheaper materials can be used, and to some extent in foundries, but owing to its greater tendency to "wildness' and consequent sponginess of the steel, the acid furnace is the one in general use in steel foundries.

When the tap hole of the open-hearth furnace is opened to withdraw the charge it cannot be closed again as is possible in iron practice, until all of the steel is run out, because the steel comes out so quickly and in such volume that it is impossible to stop it. It is necessary, therefore, that the ladle be large enough to hold the entire furnace charge. The ladle used in the steel foundry is a bottom pouring one, because many small molds must be filled, and it would be impracticable to do this with a ladle holding from fifteen to

*From a paper read before the Railway Club of Pittsburg, Sept. 23, 1904. Mr. Herron is president of the Duquesne Steel Foundry Co.

twenty-five tons by pouring over the lip. Another reason is that the slag, being lighter than the metal, floats on top and only the clean metal runs into the mold through the nozzle at the bottom of the ladle.

Methods of Molding.

On account of the high temperature of the molten steel as it is run into the mold, the latter must be made of a very refractory material. The material used in dry sand molding is a pure silica sand which is mixed in the sand mill with fire clay and molasses water to give it a bond. This mixture is used for the face of the mold, i. e., the part that comes in contact with the casting, and back of this facing "heap" sand, or sand from old molds, is rammed. After the mold has been completed it is coated with a wash consisting of ground flint, molasses and water, to give the casting a good surface. It is then taken to the oven and thoroughly dried. From the oven it goes to the casting floor, where the cores are set, the molds closed, and the metal poured. The baking of the mold makes it very hard, and great care must be exercised to prevent the casting from checking, even if the composition of the steel be good, particularly in the case of castings having thin sections, or when, by reason of the design, strains are likely to be created due to unequal cooling. Several precautions may be taken to prevent checking, among which are the cutting of thin slits at the proper places in the mold into which the steel runs, forming brackets which set quickly and strengthen the casting while it is cooling; the placing of iron rods in those places in the mold where strains will come in cooling; the cutting away of sand in the mold and the filling of the space so formed with cinders or sawdust, so that the mold will yield when the metal is contracting around it; the filing of the center of large cores with cinders or sawdust to soften them; the chilling of the steel by coming into contact with metal chills inserted into the mold, or with nails driven plentifully into the mold for the same purpose; the designing of the casting in such a way as to, as far as practicable, avoid undue variation in the thickness of the section of its different parts. Sometimes water is run through large cores, holes being left for the purpose, to cool the inside of the casting at the same time as the outside. In order to insure sound castings a sufficient number of feeding heads of good size should be used to permit the gases formed in the mold to escape and keep the mold full as the metal settles in cooling. In some cases it is well to tip the mold, i. e., to raise one end higher than the other to force the gas out at the top, as the metal rises from the lower end where it enters, and to insure the mold running full of metal.

After the casting is shaken out of the mold it goes to the cleaning room, where the sink heads or gates are cut or broken off. The sand adhering to the casting is then removed; the casting is trimmed and ground and is ready for shipment. If it is to be used in a railroad car, or locomotive, or bridge, or some other place where it will be subjected to great strains or shocks, it should be thoroughly annealed to eliminate internal strains and to increase its ductility. If resistance to wear be the quality desired in the steel, annealing will not improve but more likely injure it.

Small steel castings and castings of light sections are sometimes made in "green" molds, i. e., in molds that are not baked. This method has the advantage of being somewhat cheaper, and because the molds are soft and yielding, internal strains are not so likely to be created, as in the harder, dry molds, but castings so made are not so free from blowholes as those made in the dried molds, and are therefore not so satisfactory, particularly if they are to be machined, as the finishing process discloses the defects not otherwise apparent.

Inspection.

The inspection of steel castings as at present practiced leaves much to be desired. One inspector, using discretion, may accept a casting having slight external defects marring its appearance somewhat, perhaps, but impairing its serviceability but slightly, if at all. Another, inspecting the same casting, fearing the criticism of his superior, will insist upon perfection and reject the casting. In one instance in the experience of the writer, a railroad inspector rejected a lot of castings for external defects, in most cases scarcely discernible with the naked eye. An appeal was taken to his superior, who made a careful personal inspection of the castings and accepted practically all of them. In another instance, a lot of bridge castings were accepted at the makers' works by the representative of an inspecting company, and, subsequently, a number of them were rejected at destination by another representative of the same company. The bridge company would have accepted the rejected castings, but the engineer of the railroad company would not receive them. There were thus four different inspections made, with alternate acceptances and rejections.

No reputable manufacturer will object to any reasonable inspection, but when a casting is once accepted it should not subsequently be rejected unless for defects developed during the process of finishing, and which render the casting unsafe to use.

Manufacturer and Customer.

It is to the mutual advantage of the manufacturer and his customer that castings shall be furnished of a grade best suited to the use to which they are to be put, and to that end there should be earnest co-operation. If the manufacturer be informed as to the requirements in any case he may make the steel a little softer or a little harder than the average, to suit the special conditions existing, and he will know whether or not the casting should be annealed. If he know where the strains of service are to come, he will be able to take especial precautions to have the vital point of the casting solid. In some instances castings must be turned out so close to given sizes that a little too much rapping of the pattern in the mold will entail extra expense for machining, or perhaps cause the rejection of the casting if it must fit in place without machining. If the founder be cautioned as to the requirements in such cases he can perhaps avoid the difficulty, or, with a little chipping and the use of rough gauges, correct it and thus prevent complaints and dissatisfaction on the part of the customer. If every pattern sent to the foundry were plainly marked so as to show what parts of the casting are to be machined it would be a guide to the foundryman, who can take precautions accordingly. An occasional visit of the buyer to the foundry and of the manufacturer to his customer's works should result in good to both through the familiarity each would gain with the other's work and methods.

Everyone should profit by his failures. So when a casting fails in important service the cause of failure should, if possible, be ascertained. If it be due to any weakness of the casting it should be known so that a stronger one may replace it, or perhaps the design may be improved. The broken parts should be preserved so that the maker as well as the user may make such tests as he may desire. When defects develop in the process of finishing which cause the rejection of a casting, the manufacturer should cause the casting returned for inspection before a new one is made, or if this be impracticable because of insufficient time, a sketch showing the location and nature of the defects should be furnished him, in order that he may avoid a repetition of the trouble in making the new casting. As an aid to such investigations all important castings should bear the manufacturer's mark for the purpose of identification. In cases where the foundry stamp or mark is obliterated in the process of finishing, the casting should be restamped in the shop.

As a result of unpleasant and costly experiences with steel castings in locomotives some very intelligent and experienced railroad mechanics had reached the conclusion that some better material was imperatively needed as a substitute for steel castings, particularly for frames and wheel centers. If the cause of failure had been ascertained in each case it would doubtless have been shown that if the material was not bad, the castings were of poor design, or they had not been treated in the foundry in such a manner as to give the best results.

The buyer of steel castings who changes with every wind, now buying from one foundry and then from another, looking always for the lowest price, is not the one who may expect the best of service. Co-operation in such a case is impracticable. The expectation of a continuance of patronage

is the incentive needed by the manufacturer to excite him to his best endeavors. Familiarity with his customer's requirements enables him to better supply that customer's wants, and such knowledge comes through length of service. In such important service as in locomotives and cars, where a broken part may cause loss of property and endanger human lives, the first consideration should be safety and the constant endeavor should be to secure not the cheapest, but the best.

Substitution of Steel for Iron.

A generation ago when a railroad freight car weighing no more than seven or eight tons carried a load of ten tons at a speed of ten miles per hour; when a freight locomotive without its tender weighed but thirty tons, cast iron was considered strong enough for many parts of railroad equipment. But the rapid growth of traffic due to the country's development, the necessity for economy in operation to offset the gradual and constant reduction in freight charges and the higher speeds made possible by the introduction of the automatic coupler and the air brake, brought into service heavier cars and engines and rendered necessary the use of stronger materials in their construction; and cast iron gave way to malleable iron, with a gain in strength of one hundred percent. The development of railroad equipment has gone on at an accelerating pace, until now we have freight cars weighing twenty tons, carrying a load of fifty tons, and locomotives weighing without tenders, more than one hundred tons. Malleable iron is not suited to such service, and cast steel, which is from 50 to 100 percent stronger, is rapidly taking its place. The Master Car Builders' Association has adopted as standard the cast steel draw bar, and malleable draw bars will not likely any longer be used. Bolsters and center plates are now generally made of cast steel.

In the construction of locomotives, except those of small size, or ones intended for yard service, practically none other than steel castings are now used. And cast steel has displaced not only cast and malleable iron in important service, but the tendency is also toward its substitution for forgings. The committee of the Master Mechanics' Association that recommended at the recent meeting at Saratoga the adoption of the cast steel locomotive frame rather than the forged frame, was alive to the fact that cast steel made of good materials and properly annealed is the strongest and cheapest material that can be used in the construction of locomotives; and since the report of that committee was made, the prejudice against cast steel that had existed through misunderstandings in some minds has been visibly reduced if not entirely eradicated. The reasons given by the committee for their recommendation are as follows:

"The tensile strength of the steel, suitable for frames, is about 75,000 pounds per square inch, as compared with 53,000 to 54,000 pounds per square inch for the best hammered iron.

"The cast steel frame is practically homogeneous; that is to say, there are no welds, and it is of a uniform texture throughout its entire length.

"The number of projections required for the reception of brake work, tumbling shafts, rocker pins, etc., seriously complicates the production of modern frames in hammered iron, whereas the reverse is true in the manufacture of cast steel frames.

"Generally speaking, steel is intrinsically superior to wrought iron, and all the difficulties experienced with cast steel are mainly chargeable to either design or method of manufacture and not to the steel per se."

To which should be added the further reason that a considerable saving in the cost of locomotive frames may be effected by the substitution of cast steel for wrought iron.

The Allegheny Machine & Iron Co., Pittsburg, with offices at 1401 Arrott Bldg., of which Frank Illenberger is president, has been appointed sole eastern agent for the Automatic Gas Producer, manufactured by the American Gas Machine Co. Gas can be manufactured by this machine at 18 cents per thousand, and while the machines are designed for the production of illuminating gas, it is claimed that the product can be used to advantage in the operation of gas engines.

CRUCIBLE STEEL CO. OF AMERICA.

The statement of the Crucible Steel Co. of America, Pittsburg, which goes into the details of the disastrous Clairton Steel Co. venture, was mailed to the company's stockholders last Friday. While the statement gives the loss to the Crucible Steel Co. of the sale of the Clairton property to the United States Steel Corporation as $1,578,952, the total loss is actually $6,438,108.43. It figures out as follows:

Total investment	$16,696,369.46
Derived from sale	12,682,951.96
Loss by sale	$4,003,407.90
Premiums, interest, etc.	1,461,346.53
Loss in operation, etc.	973,454.20
Total loss	$6,438,108.43

The statement of the company to the stockholders is given below:

"For some time the management has desired to lay before the stockholders full information regarding the sale of the Clairton plant and properties to the United States Steel Corporation. Owing to a number of unadjusted accounts and that the properties were sold upon a guarantee as to their inventory and assets, the value of which could not then be ascertained with any degree of accuracy, it was impossible to make at an earlier date a complete statement giving the exact extent and character of the loss.

"Soon after the organization of the Crucible Steel Co. its management believed that it was necessary to have a larger supply of open-hearth steel than the constituent companies were able to produce. Acting upon this belief the St. Clair Steel Co. was organized Dec. 3, 1900, and a large open-hearth plant was begun. To build the plant and provide working capital, bonds to the amount of $2,250,000 were issued. Later it was thought advisable to build blast furnaces to secure a supply of pig iron for the steel works. The St. Clair Furnace Co. was, therefore, organized April 24, 1901, and to build these furnaces bonds to the amount of $3,000,000 were issued. It was afterward found that the amount of money arranged for was insufficient and that additional funds would be necessary. To obtain this money the St. Clair Steel Co. and the St. Clair Furnace Co. were consolidated under the name of the Clairton Steel Co., June 9, 1902, under which a further issue of $5,000,000 in bonds was made. The payment of all these bonds was guaranteed by your company.

"Through the purchase of iron mines, coal lands and other properties extensions to the plant and delays in construction, which prevented its being operated during a very prosperous period, together with other losses incident to the early operation of the works, this amount was entirely expended, and it became necessary for your company to advance large sums of money to pay the debts of the Clairton company, complete the plant and keep it in operation. This money was largely obtained by discounting short-time notes of your company, indorsed by the Clairton company, which notes, at maturity, were provided for Oct. 21, 1903, by an issue of $5,000,000 collateral trust bonds of your company, of which $1,600,000 were sold at par, $2,900,000 used as collateral and $500,000 remain in the treasury. At this date the undersigned was invited by the management to assume control of your company as chairman of its executive committee and at once entered upon the discharge of his duties.

"At that time the Clairton company was not only losing money, but to meet its pressing engagements growing out of the construction and operation of the plant was demanding almost daily large amounts, which your company was unwilling to furnish, and at the same time large amounts of Clairton bonds were approaching maturity. In view of these conditions it was deemed best by the management to apply for a receiver for that company. A bill in equity was accordingly filed by your company Jan. 4, 1904, asking for the appointment of a receiver for the Clairton Steel Co., whereup the court appointed the Union Trust Co., of Pittsburg, and Wm. G. Park receivers.

"A thorough investigation of the affairs of the Clairton company was then made, and according to reliable estimates it was found that after utilizing all the above mentioned bonds a further sum of $3,000,000 to $5,000,000 would be required

for working capital and to successfully conduct the business as the plant then existed. Even this large sum would probably not have been sufficient to meet the demands of the immediate future, because owing to the restricted market for billets it would have been necessary to erect a large number of finishing mills to carry the product to a more advanced state of manufacture. Furthermore, the character of the orders of your company for blooms and billets is so varied that it was found difficult to operate the Clairton works profitably on the orders of your company alone, thus making it necessary to largely dispose of its product in the open market. Therefore, after careful consideration, it was thought best under the circumstances to dispose of the plant rather than place your company under further responsibility and possibly jeopardize its very existence by attempting to retain and carry on the Clairton business. An opportunity presented itself and a sale was made, with the unanimous approval of your board of directors, to the United States Steel Corporation upon the following terms:

"First—The United States Steel Corporation to guarantee the payment of the principal and interest of the $10,250,000 of the Clairton bonds, and to assume mortgages on real estate, coal lands and mining properties to the amount of $1,666,715.31.

"Second—To assume all contracts for ore.

"Third—Pay $1,000,000, par value, of 5 percent United States Steel second mortgage sinking fund gold bonds.

"Fourth—To make a ten-year contract with your company for its requirements of Bessemer, basic and low-phosphorus pig iron and standard Bessemer and open-hearth billets, etc.

"The following statement shows the total investment in the Clairton enterprises, the sum realized from the sale and the loss sustained by your company.

Total investment covering 149 acres of land, steel and furnace plants—twelve 50-ton open-hearth furnaces and blooming mill, three blast furnaces with equipment—2,907 acres of coal lands, three large ore properties, 140 houses, 166 lots, inventories, interest and discount on bonds, etc.		$16,696,369.46
Loss prior to sale:		
(a) Premium on bonds, interest, etc.	$1,461,346.53	
(b) In operation, depreciation in inventory, royalties, taxes, etc.	973,454.20	2,434,800.73
Amount realized from sale to United States Steel Corporation		14,261,568.73
The United States Steel Corporation:		
(a) Guarantees payment of principal and interest of Clairton bonds	$10,250,000.00	
(b) Assumes mortgages on real estate, coal lands and mining properties	1,666,715.31	
(c) Delivers $1,000,000, par value, of the ten sixty-year 5 percent sinking fund gold coupon bonds	766,236.25	
Total		$12,682,951.56
Loss on sale to United States Steel Corporation		$1,578,617.17

"Your company has never carried on its books as an asset the $3,500,000 capital stock of the Clairton company. Through the sale to the United States Steel Corporation the supply of raw material which the Clairton company was intended to provide has been secured for a period of ten years by a contract with the Carnegie Steel Co., upon terms very favorable to your company. This contract was an important consideration in the sale of the property and, while it is not appraised as an asset, it is nevertheless a substantial offset against the loss, and in value may exceed it. The effect of the losses incurred in the Clairton enterprise was to increase the floating indebtedness of your company. This debt was temporarily provided for by the issue by your company of $5,000,000 of short time collateral trust bonds, heretofore referred to. This floating debt, including the bonds sold, bears interest at the rate of 6 percent and the bonds mature in three and five years from the date of their issue. It is deemed advisable to fund this debt by an issue of bonds of $6,000,000 to $7,000,000, bearing interest at a rate not exceeding 5 percent, to be secured by a first mortgage upon all the property of your company. The bonds to be issued in series, one of which shall mature (after five years) annually during twenty years.

"At the annual meeting to be held Oct. 19, 1904, the management will ask the stockholders to authorize the issue of these bonds by your board of directors at such a time as it may deem expedient.

"The carrying out of this plan, postponing the payment of the present indebtedness for a long period of years, will enable your company to distribute its surplus earnings among its stockholders at a much earlier date than if the present collateral trust bonds are paid as they mature or the indebtedness be carried along until extinguished in the form of temporary loans.

"Notwithstanding the losses to which the Clairton enterprise has subjected your company, it is in good financial condition. The additions and improvements made to your plants will offset in value those which were sold or abandoned, and out of the quick assets of your company all its debts, including the $5,000,000 collateral trust bonds, could be paid, leaving a large balance and all your plants free from incumbrances.

"Believing that you will agree with the management that the plan proposed is the best that can be adopted under the present circumstances, we would ask you to execute and return the enclosed proxy if you will be unable to attend the meeting.

(Signed) "Wm. G. Park, Chairman."

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

Business men of Clinton, Tenn., have for some time been planning the establishment of a foundry. A company has been organized and will be operated by a number of stockholders and the following officers: C. J. Sawyer, president; A. Taylor, vice president, and P. L. Johnson, secretary. C. H. Johnson will be general manager.

The Foote Bros. Gear & Machine Co. has been incorporated at Chicago with a capital of $30,000, to manufacture machinery. Incorporators are: J. B. Paine, Edith Edgren and Kathryn Lorensen.

The International Hoisting Machine Mfg. Co., Minneapolis, Minn., has been incorporated with a capital of $200,000. Incorporators are: Guy C. Grable, Edward Joseph Bricken and Claude R. Houston, all of Minneapolis.

The Universal Pasting Machine Co., Jersey City, N. J., has been incorporated with a capital of $30,000, to manufacture and sell machinery. Incorporators are: George White, 22 Morris street, Jersey City; John G. Kennedy, 327 Lenox avenue, New York; William W. Lasker, 6 Clifford place, Brooklyn; Ernest O. Champ, 308 West Ninety-third street, New York; and Charles J. Klebel, 204 West Seventy-sixth street, New York.

The McGarigle Machine Co., Niagara Falls, N. Y., has been incorporated with a capital of $10,000. Incorporators are: P. H. McGarigle, Julia C. McGarigle and Katherine McGarigle.

The Johnson Forging & Flanging Co., Chicago, has been incorporated with a capital of $25,000. Incorporators are: James N. Johnson, Thomas S. Chambers and M. Lester Coffeen.

M. Eugene Blin, of Paris, junior member of the firm of Malicet & Blin, automobile manufacturers, is now acting as a judge of automobile awards at the St. Louis Exposition. He will visit the plants of a number of machine tool builders in Ohio and Illinois, as he has already done in the East, and will place orders for machine tool amounting to about $60,000.

The Brooklyn Rapid Transit Railroad Co. will soon be in the market for complete machine shop equipment, for the repair shop which it will build at Thirty-sixth street and Fifth avenue, Brooklyn.

The Bureau of Supplies and Accounts, navy department, Washington, will receive bids until Oct. 11 for a quantity of machine tools for the Portsmouth, Boston, Annapolis and Norfolk navy yards, including shifting locomotive, drills, lathes,

grinders, pulleys, borer, blower, boring mills, drill press, crank shaper, dove-tailing machine, band scroll, pumping outfit, revolving crane, cable cars, saw bench and motor drive.

The Union Iron Works, Ltd., Jennings, La., have been incorporated to operate a machine shop and iron works in the oil field, manufacturing working tools, piping, packing, oil well supplies, etc.

The Morris Stemming Machine Co., Richmond, Va., has been incorporated with a capital of $10,000 to $100,000. Officers are: F. A. P. Morton, president; A. J. Chewning, vice-president; A. P. Spotts, secretary and treasurer; R. C. Strickland, corporator.

The M. H. Reynolds Steel Safe & Mfg. Co. has been organized at Spokane, Wash., to manufacture burglar and fireproof safes, vaults, jail cells, chemical fire engines and other iron and steel specialties.

The Pan-American Railroad Co. is reported to be in the market for 15,000 tons of steel rails. The road is being built by Walter and Franklin Everett, two Nebraskan men. It will run along the Pacific slope of the Sierra Madre mountains and is destined to form a link in the rail system which will eventually connect North and South America.

The Gem Stove Co., West Point, Mass., has been incorporated to manufacture stoves, grates, fronts, fenders, etc. Equipment will also be installed for manufacturing hot-air furnaces, and the company will at once arrange for the erection of necessary buildings.

Fires and Accidents:—

The South Bethlehem Steel Works, South Bethlehem, Pa., were visited by fire September 24. The structural building, pattern shops and several other structures were damaged. The loss on buildings and machinery is estimated at about $75,000.

The plant of the Reierson Machine Co., Portland, Ore., was recently damaged by fire to the extent of $30,000.

The Cyclops Steel Works, Titusville, Pa., were almost totally destroyed by fire Sept. 11. The loss to the buildings was $3,000 and that to the machinery considerably more.

Fire at the plant of the J. A. Fay & Egan Co., Cincinnati, O., manufacturer of wood-working machinery, Sept. 23, caused a loss of $138,000. Only a part of the large plant was destroyed and arrangements have already been made to carry on manufacturing so that filling of orders will not be interrupted.

New Construction:—

The Border Bolt & Nutlock Co., Richmond, Ind., has almost completed its plant and will soon be ready to turn out 50,000 bolts and nuts a day. The main building is 40 x 100 ft., equipped with modern machinery.

The receiver of the Matthews Steel Casting Co., Matthews, Ind., has sold the plant to P. A. Hughes and Guy S. Rinebolt, of Johnstown, Pa., and W. K. Gore and Philip Augsten, of Chicago, who have organized a stock company and are erecting a building 40 x 285 ft. as an addition to the plant.

The new buildings which the Indianapolis Drop Forging Co., Indianapolis, Ind., will build to replace those recently burned will be as follows: Hammer shop, 55 x 135 ft.; machine shop, 50 x 250 ft.; boiler house, 35 x 50 ft.; warehouse and office, 50 x 60 ft.

J. H. Hettinger, 160 Washington street, Chicago, will erect a building 40 x 100 ft. for the manufacture of machinists' specialties. A gasoline engine, shafting, etc., will be required.

The British Columbia Electric Railway Co., New Westminster, B. C., is rebuilding its plant which was destroyed by fire Aug. 13. The main building will be 75 x 180 ft., with office, boiler room and paint shop annexes. Orders for machinery have been placed. It is expected that the plant will be in operation by Nov. 1.

The Oregon Short Line has broken ground for extensive shops at Salt Lake City, Utah. The road has outgrown its present shops in that city and has for some time been much in need of increased facilities. The old buildings are to be razed and a new depot erected on the ground they now occupy.

Davis & Thomas, of Catasauqua, Pa., are extending their foundry by erecting a new building 50 x 200 ft. of brick and steel construction. The contract for the structural work has been awarded to the Berlin Construction Co., of Berlin, Conn. The cupola capacity of the foundry will be increased 100 tons a day and the cupolas will be equipped with electric hoists and conveyors. This addition was built because of the contract for furnishing 52,000 tons of finished castings for the Pennsylvania tunnel under the East river. Orders have been placed for about $50,000 worth of special machinery for finishing tunnel rings, and twenty electric cranes of a capacity of two tons will be purchased.

A tract of land has been purchased and specifications issued for bids for the foundations of the large car building plant of the Canada Car Co., at Montreal.

The Steubner Iron Works, Long Island City, L. I., have purchased a site and will build a foundry and mill to take the place of the plant razed to make way for the Pennsylvania tunnel.

The Atlantic Coast Line contemplates new construction which will double the capacity of its shops at Rocky Mount, N. C.

The Columbia Tool Steel Co., of Chicago Heights, Ill., will erect a large tool steel plant at that place, the contracts for the buildings having been awarded some time ago. Contracts for the rolling mill machinery were awarded last week to the Lewis Foundry & Machine Co., Pittsburg, for two three-high 9 and 14-in. merchant mills. For the present this will represent the company's entire rolling capacity, although it may be increased in the near future. The Mesta Machine Co., Pittsburg, was awarded the contract for the installation of the rolling mill engine, 36 x 42, of the auotmatic piston valve type.

The United Engineering & Foundry Co., Pittsburg, has been awarded the contract for the erection of the sheet bar mill which the Republic Iron & Steel Co. will install at its Brown-Bonnell plant, Youngstown, O. It will have a daily capacity of sheet and tin bars amounting to about 600 tons.

The Eastwood & Mankin Foundry Co., Sherman, Texas, whose plant was recently destroyed by fire, will rebuild, but on what scale has not been decided.

The Pennsylvania railroad has awarded contracts for its new shops at Greenville, Pa. The buildings consist of a machine shops and store room, 160 x 41 ft., and several other buildings.

The Louisville Machine Co., Louisville, O., recently incorporated with $10,000 paid up capital, will build at once and equip its plant to make a general line of machinery.

The Morgan Spring Co., Worcester, Mass., will erect a new building 72 x 115 ft., three stories and basement. The additional space will be devoted to general manufacturing.

The new building of the Southern Iron & Wire Mfg. Co., Dallas, Tex., is rapidly nearing completion and will probably be occupied by Oct. 15. Structural iron work and wire will be manufactured.

Bids have been received for the construction of the new shop of the Erie City Iron Works, Erie, Pa. The new building will be a steel and brick structure 600 x 150 ft., and will cost between $80,000 and $100,000, exclusive of machinery.

The Beloit Iron Works, Beloit, Wis., will build an addition 200 x 50 ft., to be used as a setting up room in connection with the machine shop.

The Keystone Foundry Co., of Pekin, Ill., is enlarging its foundry by tearing out the partition between two of the buildings, changing the floor level and filling up the buildings in such a way as to increase the foundry floor area about 60 percent.

The Wheeling Mold & Foundry Co., Wheeling, W. Va., has shut down its plant for a few weeks and has a large force of structural iron workers engaged in rearranging the plant to fit it especially for handling the Pennsylvania tunnel contract.

General Industrial Notes:—

The Young Repeating Arms Co., Columbus, O., has sold its plant, equipment and stock to the Sears-Roebuck Co., Boston, which will dismantle the plant and move the machinery to Boston.

The first castings were made by the Iowa Malleable Iron Co., Fairfield, Ia., last week. The main foundry of its plant is 106 x 142 ft., the cleaning room 42 x 108 ft., shipping and

annealing rooms 86 x 118 ft. The buildings are well constructed with concrete foundations with 4½ ft. of brick wall, pressed steel siding and asphalt roofing. The foundry will have 64 molders and will use 24 molding machines. The company has a large number of orders on hand.

The General Engine Co., recently incorporated at Buffalo with a capital stock of $100,000, will manufacture rotary engines of the Hoffman type.

The old iron foundry of the Wabash Valley Foundry Co., Vincennes, Ind., has been sold to A. Brandon Clarke. The foundry was established in 1865 and has three brick buildings —office, machine shop and foundry.

The entire equipment of machinery of George E. Lloyd & Co.'s plant, Elkhart, Ind., has been bought from the receiver by the J. H. Dawson Machinery Co., Chicago.

The Gunnell Tool Co., Manitowoc, Wis., recently incorporated, will make a specialty of pneumatic rivet heating forges, hose couplings, riveting machines, etc.

The iron ore mines of the Newark Mining Co., near Allentown, Pa., will be sold to satisfy wage claims. The miners quit work July 1 with two months' wages due them.

Cunningham Bros.' Foundry & Machine Shops is the name of a new concern established at Bellefonte, Pa., by J. Mitch and Edward Cunningham, who have purchased the lot and building of the defunct Houser Springless Lock Co. Considerable new machinery will be installed.

The Iowa Foundry Co., Sioux City, Ia., is about to begin operations in its newly acquired plant. All of the members of the company are skilled foundrymen.

The Central Machine Co., Niagara Falls, N. Y., is now quartered in its new building at the corner of Lawrence avenue and Thirteenth street. The building is a two story brick, 60 x 120 ft., equipped with modern machinery. The company makes a specialty of repairing electric machines.

The Summit Foundry Co., La Crosse, Wis., has begun operations in the property formerly occupied by the Fountain City Drill Co. The plant is being remodeled to serve the purposes of the new company in the manufacture of stoves.

The new plant of the United States Malleable Casting Co., Toledo, O., has been completed and is now in operation.

The postmaster general has awarded to the Van Dorn Iron Works, Cleveland, the contract for furnishing street packge boxes and combination package and letter boxes for the free delivery service for four years from July 1, 1904.

The Cruse-Kemper Co., Atlantic City, N. J., is the successor of the Pettit Ornamental Iron & Fence Co. Mr. Kemper, who has for many years represented the old company in Atlantic City, is in charge of the business of the new concern.

The Eagle Foundry Co., Muncie, Ind., recently incorporated, succeeds the Eagle Brass & Iron Foundry Co. A strike was in progress at the plant throughout the summer. The company sold each of its employes one share of stock and is now working 60 hours, full handed, each week.

The Morris Hardware Mfg. Co., Marion, Ind., recently incorporated, has elected the following officers: President, C. F. Morris, Marion; vice president, W. F. Coulter, Columbus; secretary, B. F. Reybold, Saginaw, Mich.; and secretary, C. L. W. Krause, Indianapolis. All of the shareholders in the corporation are traveling men. Many novelties in the hardware line will be manufactured.

The Electric Controller & Supply Co., of Cleveland, reports among its recent business several large orders. The installation of a complete system of magnetic switch control for five unloaders and a thorough equipment of magnetic switch controllers for a No. 3 reloading ore bridge is nearly finished at the Buffalo plant of the Lackawanna Steel Co. An equally complete system of magnetic switch control is now being installed for ore unloaders at the Lorain Steel Co.'s plant of the United States Steel Corporation. All the motors are provided with automatic safety cutouts for both the Lorain and Lackawanna plants. The Electric Controller & Supply Co. has an order for a direct motor drive for a 60-in. planer. This order is for shipment to the West Albany shops of the New York Central & Hudson River railroad. The improved motor drive for planers is attracting considerable attention in the company's display at the World's Fair.

The recently incorporated Motch & Merryweather Machinery Co., Cleveland, has bought out the Ohio and Eastern Michigan business of the Marshall & Huschart Machinery Co. and will carry a large line of machine tools at the warerooms, Nos. 24 and 26 Lake street. The company represents the full line of agencies which the Marshall & Huschart Co. had.

Wm. Ganschow, 12-14 South Clinton street, Chicago, has just purchased the entire bevel gear cutting plant of the Foster-Kimball Machine Co., of that city, and will be able, in the future, to give attention to any bevel gear planing work that may be offered. He expects to add several more machines to this line, which, with his already excellent facilities for carrying on this special business, will enable him to fill orders very quickly.

The Citico furnace, at Chattanooga, Tenn., will blow out for repairs at once and will not be in blast again for six weeks.

Benj. Middleditch, Detroit, Mich., whose recent removal from Iron street to his new two-story brick building at 97-103 Meldrum avenue was noted in these columns, manufactures brass founders' and finishers' machinery and flasks, and is a contractor for special machinery, but is not, as was erroneously stated, a brass founder and finisher.

The U. S. Oil Extracting Machinery Co., Decatur, Ill., recently incorporated, manufactures a patented apparatus for the extraction of oil from cereal and vegetable products, as well as from scrap leather. Oil has been extracted through the agency of a solvent for a great many years, but with little success owing to the loss of the naphtha or other solvents used. It is claimed that with the apparatus of this company it is possible to perform the entire operation necessary for the extraction of the oil and the drying of the product after the oil is extracted without any loss whatever and at small expense. The machine is rotary in motion and allows the naphtha to percolate through the germs or other product more rapidly than when the stationary machine is used. The company expects to build a plant, but for the present is having the machines built for it.

The Buckeye Machinery Co., Columbus, O., recently incorporated, is organized for buying and selling second-hand machinery, and in the future will build some small machines that it has in view. The company takes over the business of G. W. Shartle, of Osborn, O., and J. A. Taft & Co., of Columbus. Mr. Shartle is president, C. F. Andrews, vice president, and J. A. Taft, secretary and treasurer. The office is in the New Hayden building.

The Sligo Iron & Steel Co., Pittsburg, will make extensive improvements at its plant, Connellsville, Pa. The bar mill is to be practically rebuilt and a three-high stand of rolls added, while in the sheet mill department a new shear will be installed that will cut up to 90 in. in width. Hot scales are also to be added. The mill is operating in full, and the management reports a nice run of orders for future delivery.

The Union Rail Co., Pittsburg, is preparing to roll brake and bulg beams at its mill, Huntington, W. Va., and is now soliciting orders for the same. President A. F. Baumgarten reports that orders are now on the books for several months' delivery of light steel rails from 16 to 40-lb. sections.

The L. Schreiber & Sons Co., an architectural iron concern, has taken possession of its new plant in Norwood, near Cincinnati.

The Union Iron Works, one of the properties of the former United States Shipbuilding Co., was sold at public auction September 26 to Francis Pollock, representing the reorganization committee of the new shipbuilding company, 70 percent of the stock of which is owned by Charles M. Schwab. His bid of $1,700,000, the minimum allowed under the terms of the sale, was accepted. The plant of the Harlan & Hollingsworth Co., Wilmington, Del., is now the only one of the former properties of the United States Shipbuilding Co. which has not been sold to the reorganization committee.

A petition to have the Columbus Motor Vehicle Co., of Columbus, O., declared bankrupt has been filed in the United States court. The petitioning creditors and the amounts claimed to be due them are as follows: The Interstate Foundry Co., of Cleveland, O., $722.17; the Hartford Rubber Works Co., Hartford, Conn., $330.88; the Brown-Pips Gear Co., Syracuse, N. Y., $744.86. The defendants made an assignment on the 18th inst.

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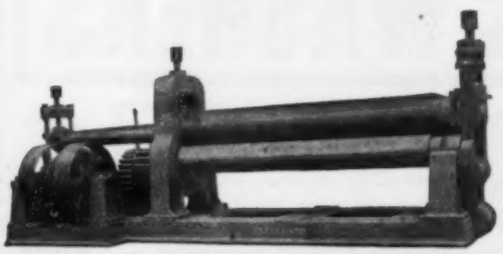

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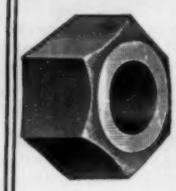

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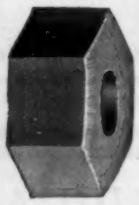

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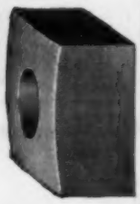

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